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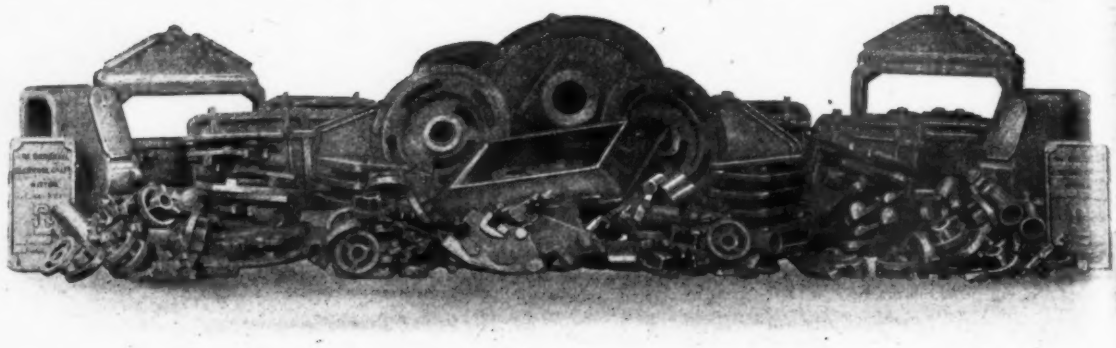

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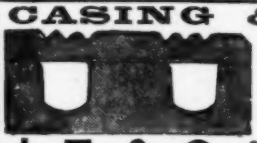

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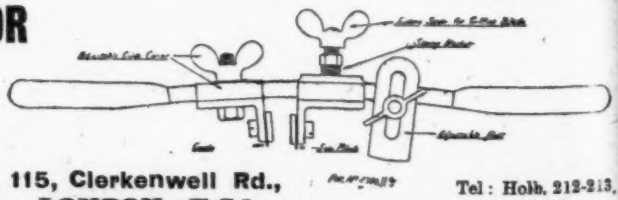

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Transmission at Very High Pressure.

THE desirability of overhead transmission in this country is a much debated question; there is no doubt that schemes for such transmission are at present receiving close consideration, and many overhead lines are already in operation on a fairly extensive scale.

Whether overhead systems are widely used in the future or not, the transmission of power at pressures above those already adopted in this country is inevitable, in view of the fast increasing load and the probability of the materialisation of the Electricity Commissioners' schemes for the erection of large interconnected generating stations.

The paper read before the Junior Institution of Engineers by Major A. M. Taylor, M.I.E.E., M.Am.I.E.E., on January 16th, which is reported elsewhere in this issue, brings us face to face with this problem. Up to recent times the impracticability of using underground cables for pressures much above 33,000 volts has seriously handicapped the development of high-pressure transmission, though cables have been successfully manufactured for pressures up to 66,000 volts. That underground cables must remain the means of transmission in the urban districts of the Homeland, whether overhead lines are generally adopted in the more sparsely populated areas or not, is certain, and the production of a cable to stand pressures up to 100,000 volts, such as that described by Major Taylor, would be welcomed. He has done valuable work by experimenting with cable in which the high pressure is distributed over intersheaths, and the results of the tests to which the cable has been subjected are very encouraging.

Although Major Taylor does not give us details as to the cost of manufacture of his cable, he assures us that it is not prohibitive, and compares favourably with that of cables of the single-core type; and while the dielectric losses of the Taylor cable are comparatively heavy, the current-carrying capacity is greatly increased by virtue of the decreased heating effect.

It will be noted that the cable is a modification of that which was to be used in connection with the "Hexaphase" system (which, by the way, Major Taylor still advocates as a desirable "entirely underground" system), and is designed to be used in a combination of underground and overhead mains forming "the compensated three-phase system." The vital point, however, is the possibility of transmitting underground at very high pressures, and we await with interest a further report from Major Taylor, which we understand will be furnished in a few months' time.

From the New Year issue of the *Electrical World* we note that there are two systems working at 220,000 volts in the United States which will be completed to 60 miles and 29 miles respectively this year, and two other lines at this pressure will be commenced, respectively 100 and 250 miles in length. It is held, however, that higher pressures will not be required for a long time to come. In this country the distances to be traversed are shorter, but if economic conditions indicate that a pressure of 100,000 volts should be used, we have no doubt that means will be found to make it available. Moreover, British cable makers should not (and do not) confine their attention to the needs of the home country; as Major Taylor pointed out, they should be ready to cope with long high-pressure transmission lines in other countries, where they are certainly required.

Our Electrical Export Trade.

SCANT justice has been done to the electrical industries of this country by many of the daily papers that have reviewed the recently-issued trade returns for 1924. They have spread the impression that our electrical exports are a declining trade. For example, *The Times*, in remarking that most industries recorded larger exports, adds: "Amongst the exceptions being electrical goods and apparatus." We do not suggest that this statement is not correct so far as it goes, but we say emphatically that it does not go far enough. Had a proper comparison been made, the statement could have been modified considerably. The *Manchester Guardian* is less sweeping, but in its news columns it says: "There were falls in electrical goods," and in its editorial page: "Electrical goods, too, compare badly with last year's trade, at all events in December shipments." By the *Liverpool Journal of Commerce* the bald statement is made that electrical goods and apparatus show a falling-off of £1,719,502. The fact is that none of these writers has noticed that in December, 1923, there was an exceptionally large shipment, valued at no less than £1,914,214, of submarine cable, whereas the usual *annual* exports under this heading are in the neighbourhood of only £400,000. It is not a fair statistical comparison to represent the shipments of electrical goods and apparatus generally as having declined, when the previous year's figures are swollen by an amount which cannot be expected to recur regularly. In another respect justice has not been done to the industry, because the exports of electrical machinery have been ignored. They amounted in value to £5,262,581 in 1924, as compared with £3,951,095 in 1923. Thus, if we leave submarine cables out altogether, but include electrical machinery in our comparison, we arrive at a value of electrical goods and machinery exported in 1924 of nearly £15,000,000, against £11,600,000 in 1923.

Electrical Commercial Travellers.

WE give later in this issue a brief report of the meeting at which the Electrical Trades Commercial Travellers' Association was inaugurated. As we have already dealt somewhat fully with the subject, little more need be said at this juncture. It is obvious that considerable interest is being taken in the movement, and the desire for information is a satisfactory sign. We regard the decision of the meeting to adhere to the old term "commercial traveller" as reasonable; we may not be impressed with the title of the association, but there are plenty of organisations which have rendered splendid service in spite of clumsy titles. The experience of the big bodies of men connected with commercial travelling on the point of qualifications for membership is of value. From a statement attributed to Mr. A. S. Markes, we gather that a commercial traveller is defined as a person engaged in visiting tradesmen, professional men, public bodies, or persons, other than householders, for the purpose of securing orders on behalf of manufacturers, merchants, or wholesale houses. As commercial travelling is so frequently taken up by those who "have a shot at it" because they have nothing else to do, and is often dropped again in a short space of time, there must be evidence of stability before admission, therefore nobody is eligible for membership unless he can prove that he is travelling for at least six months per annum. Rules are being drafted for submission to a general meeting of members. In the meantime eligible men connected with the electrical trade may be urged to get into communication with the honorary secretary.

German Radio Apparatus.

FROM reports recently received from German sources it has been easy to gain the impression that the British market was about to be flooded with German-made headphones and other radio apparatus. One company alone claims to have placed 250,000 German 'phones here during the past six months. We have no evidence to prove that some very large headphone orders have not been executed, deliveries being given and sales effected in various parts of the United Kingdom. But if we are to believe the statements made by a special technical commissioner who recently returned from the Berlin Wireless Exhibition, where he made a thorough examination of the exhibits of German-made products on behalf of the *Wireless Trader*, the quality of the work displayed was such as to tone down considerably any fears that one might have of immediate technical competitive ability. In our issue of December 26th, 1924 (p. 977) we quoted a German writer, who referred to the Berlin exhibition as the first united demonstration of the technical efficiency of the German radio industry. He confessed that all had not been well previously, but added that far more attention was now being devoted to technical development and to the improvement of quality. To British eyes the "demonstration of technical efficiency" was a poor thing, for the *Wireless Trader* commissioner, who visited every stand in the building, records that to the enthusiast who delights in the handling of good stuff the exhibits were disappointing in the extreme. So far as concerns competing with British manufacturers, it is declared unhesitatingly that Germany is *at present* out of the market absolutely in respect of receiving sets. "The cheaper articles were in many cases out of date, as was proved by the exhibiting of slide inductances with all terminals let into the bare wood, and no attempt at adequate insulation." The general impression of the smaller makers' efforts was that they were floundering in unknown waters and were badly out of their depth. "In sets for the home constructor, nothing even remotely approaching the British article, either in design, quality, or value for money, could be seen." The writer wisely adds a word of caution. It is hardly likely that this technical inefficiency will be permitted to continue, and while the circumstances of the moment are against any German invasion of this market, British firms will be well advised not to indulge in self-satisfaction and self-laudation, but to set to work harder to consolidate their present favourable position. It has to be remembered that when the German maker fully realises his shortcomings he will probably import good British apparatus and copy lines with which he may be able to put up effective competition in both the home and Colonial markets.

The 1925 Budget and Industry.

IN all probability the Chancellor of the Exchequer will shortly receive a deputation from the Federation of British Industries, which is anxious to impress upon him the urgent necessity for industry to be relieved of part of its present burden of direct taxation so that it may more rapidly recover and develop, affording increased employment. As the Chancellor approaches the Budget problems for 1925 he will have before him the decision of the Federation's Executive Committee to ask for a substantial reduction in income tax; for relief to be given to private firms which have to pay super-tax on moneys put to reserve for the development of their businesses; and that moneys put to reserve by limited companies should be either exempt from income tax or subjected to a rate lower than the standard rate. The question of double taxation on the foreign activities of British firms will also be raised, while the need for a reduction in postal charges and stamps on cheques will be stressed.

On January 6th a representative of the Federation (Mr. R. G. Glenday) gave exhaustive evidence (fully reported in *The Times* for January 7th) before Lord Colwyn's Committee on the National Debt, showing how closely related was the effect of taxation and of different methods of debt redemption to the maintenance and development of the wealth-producing capacity of the country. We quoted last week ("British Industry and Allied Debts," p. 96) the important letter by Sir Edward Manville on the same subject, and we would advise our readers to read the report of Mr. Glenday's evidence. Among other points clearly and emphatically put was that the maintenance of a high rate of taxation for the repayment of debt might involve so serious a strain on industry as far to outweigh any advantage gained by debt reduction. He put forward figures showing the effect of taxation upon the amount invested in industrial enterprise and how debt redemption meant the transfer of wealth from industrial to gilt-edged securities.

The Chancellor of the Exchequer will not be slow to appreciate the disadvantageous position of British industry as it comes more and more to grips with competition from foreign firms which are subject to far less onerous burdens. If the financial position permits, and if the effects of the Paris conferences are favourable, he will have an opportunity of evoking from industry a further sigh of relief such as it expressed at the result of the stabilising election of last autumn. Perhaps the best and the most effective method of reducing our national payments for unemployment relief is the lifting of the burdens that prevent the free development of industrial enterprise.

Conditions in Brazil.

ELSEWHERE in this issue we publish a review of the latest report of Mr. E. Hambloch, H.M. Commercial Secretary at Rio de Janeiro, in so far as it concerns the electrical and allied industries.

It is not easy to form general conclusions from the report, but one fact appears to be very prominent; that is, while Brazil, on account of its enormous natural resources, is a rich country, the actual financial position is still critical. There are many reasons for this, the principal being, perhaps, the congregation of Brazil's small population in the main centres rendering the development of the resources of the interior very difficult owing to the shortage of labour.

The flight of the towns is due to the opening-up of so-called national industries, but Mr. Hambloch is of the opinion that the manufactures thus produced are not likely to be able to withstand foreign competition when the exchange improves and better conditions prevail in Europe. These industries are of artificial growth, being protected by high tariffs, and are adding to the already excessive cost of living. Meanwhile the growers of the produce by which Brazil is alone able to balance her trade figures are severely handicapped, not only by the above-mentioned labour shortage, but also by the export taxes levied upon their produce.

Following the visit of the British Financial Mission, great efforts are being made to straighten out the Republic's finances. As a result, the deficit in 1923 was only half of those of the two years immediately preceding it; nevertheless, the adverse balance was still exceedingly heavy. A committee, corresponding to the Geddes Committee in this country, has recommended some very drastic "cuts" in administrative expenses, and this and other action in the same direction has led to optimism in the Government's views of the situation.

It is good to learn that Great Britain retained her position as Brazil's chief supplier during 1923, but, in this market too, German exporters are very much in evidence with prices which are stated to bear little relation to the cost of production, even in Germany.

The Commercial Secretary attributes a great deal of Germany's success to the extended credits which are being allowed to Brazilian buyers, and he urges British importers to give serious consideration to the subject, for unless the credit terms can be widened their task of obtaining new customers is likely to be difficult.

The subject of suitable catalogues is again raised in the report. The necessity for producing these in the language of the country and giving dimensions, &c., in the systems in vogue there has been very often stressed in these columns and elsewhere, and we hope that due attention will be paid to the matter; it is one of the things which may be considered of little importance, but is really an essential in securing business.

With regard to these and other matters, there appears to be a need for a closer study of the Brazilian and other South American markets. At a recent dinner Mr. A. C. Rouse, head of the South American section of the F.B.I., emphasised this need. He said that, although we had practically re-established ourselves as the principal exporting country to Latin America, it was essential that we should study those countries and not be too satisfied with the present position.

An opportunity for exporters to gain first-hand knowledge of Brazil will occur next week, when Mr. Hambloch, who is at present in this country, will meet those interested by appointment at the Department of Overseas Trade.

The Telephone Service.

A FORTNIGHT ago we commented on the far-reaching effects of the stormy weather which marked the arrival of the New Year, on the telephone service of this country, and referred to the reported failures of underground cables. Since then further and more accurate particulars have become available, and it is reassuring to know that the main underground cable system was not damaged, though local line cables in the South-Midland District, North Wales, and the London (Richmond) area were put out of commission. The cable faults are attributed to small flaws in plumbed joints, which escape detection during the construction tests, but develop in course of time and reveal themselves when the manholes are flooded.

The serious interruptions and restrictions of service which occurred were mainly due, it appears, to damage done on the overhead lines, mostly by falling trees and branches, which, of course, no line could withstand. The underground cables to Cardiff, Glasgow, and Newcastle are not yet completed, and the full repeater equipment is not yet available for the London-Bristol cable; the Dublin trunk line is mainly overhead. The cable service between London and Manchester was not affected, but the overhead circuits have been retained in use to supplement the underground service, on account of the heavy traffic on this route, and the breakdowns on the overhead lines resulted in restricting the traffic.

It is evident, therefore, that we are still in great measure dependent on overhead lines for trunk telephone communication, and so long as that condition exists it will be impossible to prevent interruptions in stormy weather; but we may hope that the completion of the cable system will put an end to them.

Electricity on Board Ship.

The Electrical Installation of the t.s.s. "Orama."

THE satisfactory results of the trials on the river Clyde and in the Irish Sea of the new Orient Line 20,000-ton passenger turbine steamship *Orama*, fig. 1, built at Barrow by Messrs. Vickers, Ltd., are claimed to be due in no small measure to the extensive use of electricity, and the company's superintending engineer is to be congratulated on the design and layout of the equipment. With the exception of the propulsion of the ship and her main boiler feed and condenser water-circulating pumps, electricity is used throughout for

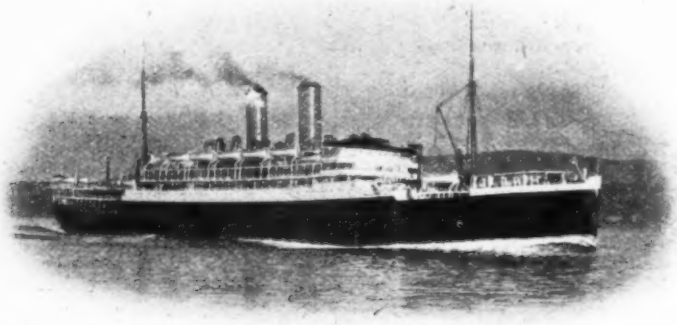


Fig. 1.—The s.s. "Orama"; Orient Line.

almost every purpose, from the driving of the extensive auxiliary plant to the provision of every comfort in the passenger accommodation.

As a result, remarkable fuel economy has been achieved, constituting what is said to be a world's record. The contract provided for the fuel consumption at various powers being guaranteed by the builders, and the consumption during the two trial runs of 24 hours' duration was of special importance. The results obtained were, at 18.8 knots, 0.924 lb. per s.h.p. per hour, and at 14 knots 0.785 lb. per s.h.p. per hour. These figures, including as they do the fuel consumption for all purposes, are very low, and are claimed by the builders to be undoubtedly due to some extent to the extensive use of electrically-driven auxiliaries and superheated steam in the main propelling turbines and turbo-electric generators.

The arrangement of the turbine installation is a novel one in merchant practice; there are three machines, *i.e.*, h.p., i.p., and l.p., in series on each shaft, each turbine working through an independent pinion on the main gear wheel. Steam is supplied at 215 lb. per sq. in. working pressure, superheated to 544 deg. F., by six double-ended and four single-ended boilers working with Howden forced draught and burning oil fuel on the Wallsend-Howden system.

Electricity is generated by three turbo-driven, compound-wound d.c. generators, each having a normal capacity of 400 kW at a pressure of 220 volts, and an overload capacity of 25 per cent. for two hours. The turbine of each set runs at 5,000 r.p.m., driving the dynamos at 500 r.p.m. through reduction gear. The three sets are mounted together in a dynamo room on "G" deck immediately over the forward end of the engine room, access being obtained from the engine hatch. Anti-vibration material is fitted under each machine. Steam is supplied at a pressure of 215 lb. per sq. in., with a superheat of 150 deg. F., and the sets are capable of developing their full power against a back pressure of 25 lb. per sq. in. absolute. In view of the vessel's service through the tropics, special consideration was given to the ventilation arrangements of the dynamo room. The machines, one of which is shown in fig. 2, were manufactured by Messrs. W. H. Allen, Sons and Co., Ltd.

An emergency dynamo is fitted in a separate house on "A" deck; it comprises a 36-kW, compound-wound, 220-volt machine driven by a two-cylinder heavy-oil engine at a speed of 325 r.p.m. This set, also made by Messrs. Allen, is illustrated in fig. 3.

The arrangement of the main switchboards is interesting; they comprise three separate dynamo panels—one on the port side of the dynamo room, one on the centre line, and one on the starboard side—which are connected to their respective dynamos by means of copper bars suspended across the roof on insulators. In addition, the three panels are interconnected by copper bars, and heavy bus-bar paralleling switches are fitted. These arrangements make it possible to run the port and starboard dynamos independently on their respective switchboards, with the centre machine spare and available for use on either switchboard should the necessity arise. Alternatively, should the load conditions permit, the two switchboards can be paralleled and supplied from any one of the machines, or all in parallel.

Distribution is effected by means of two main switchboards alongside the port and starboard dynamo panels respectively. Important circuits are alternatively fed from either the port or starboard switchboards so that, in the event of fire or a breakdown at one switchboard or dynamo, all the important circuits affected can be transferred to the opposite switchboard and dynamo with the minimum delay.

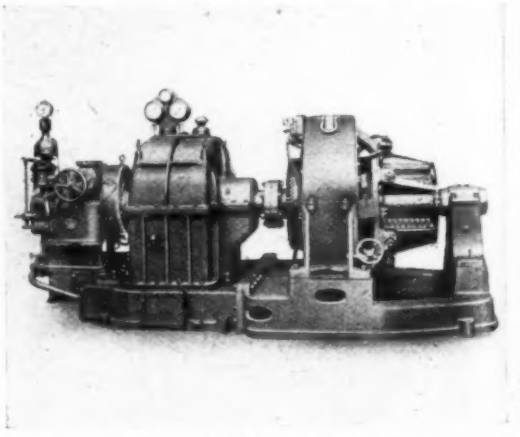


Fig. 2.—One of the Main D.C. Turbo-generators.

The starboard switchboard (incomplete) is shown in fig. 4, and the port switchboard in fig. 5.

Change-over switches are fitted so that the bus-bars of the main switchboard can be supplied from the emergency dynamo, and facilities are also provided to feed the bus-bars of the emergency switchboard from the main switchboard. Normally, all emergency circuits can thus be supplied through the emergency switchboard from the main board. Under emergency conditions, when the emergency generator is supplying its own switchboard and consequently all emergency circuits, it is also possible to energise the main switchboard and provide a limited supply for important circuits. This feature is most serviceable during periods in dry dock, or when it becomes necessary to shut off the steam supply.

As is usual in vessels of this class, auxiliary switchboards are fitted in convenient parts of the vessel to facilitate distribution to the power, lighting and heating circuits, but special precautions have been taken in the *Orama* so far as the feeding of these switchboards is concerned. Where the satisfactory running of the ship is dependent on an uninterrupted supply, the auxiliary switchboard involved is provided with two pairs of busbars which are connected respectively to the port and starboard main switchboards, and change-over switches enable the important branch circuits to be fed at will from either side of the ship. For example, practically the whole of the engine-room auxiliaries are motor driven and, as the accidental stoppage of any one important unit might necessitate a partial shut-down, the novel switching and feeding arrangements obtaining will enable the engineer to take the engine room supply from any of the three turbo-generators through either main switchboards or from the emergency dynamo.

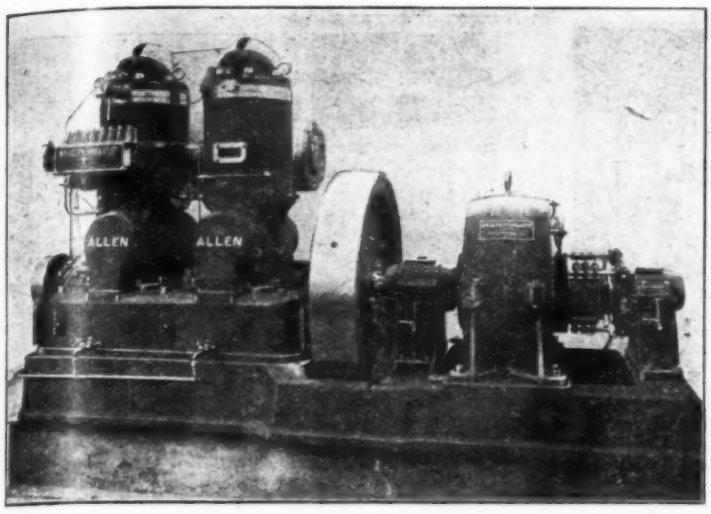


Fig. 3.—The Emergency Dynamo.

The auxiliary switchboards not provided with alternative feeds from either main switchboard are supplied through duplicated main cables, one pair being run along the port alleyway and one along the starboard side, thus avoiding any interruption in the event of local damage to the main cables which might take some time to repair. One of the engine-room auxiliary boards is shown in fig. 6. The emergency switchboard is in the emergency dynamo room, and controls the supply from either the main or emergency dynamos to the various lighting and power circuits considered essential in cases of emergency.

The whole of the switchboards were designed and manufactured by the Metropolitan-Vickers Electrical Co., Ltd., which, in view of the many alternative methods of supply specified, is to be congratulated on the neat and workmanlike design.

Electrical energy is also utilised to a considerable extent in the galley, the equipment comprising mainly two roasting ovens each taking 20 kW, two baker's ovens of similar size, two grills each taking 10 kW, and a toaster of 18 kW capacity. In addition, electricity is used for dish washing, knife cleaning, silver burnishing, dough mixing, milk emulsifying, ice-cream freezing, whisking, potato peeling, &c.

A fully equipped electrically-driven laundry is fitted aft in connection with the ship's service, and ironing rooms are provided in the accommodation spaces for the convenience of passengers.

With the exception of the forward windlass, the whole of the deck machinery is electrically driven; it

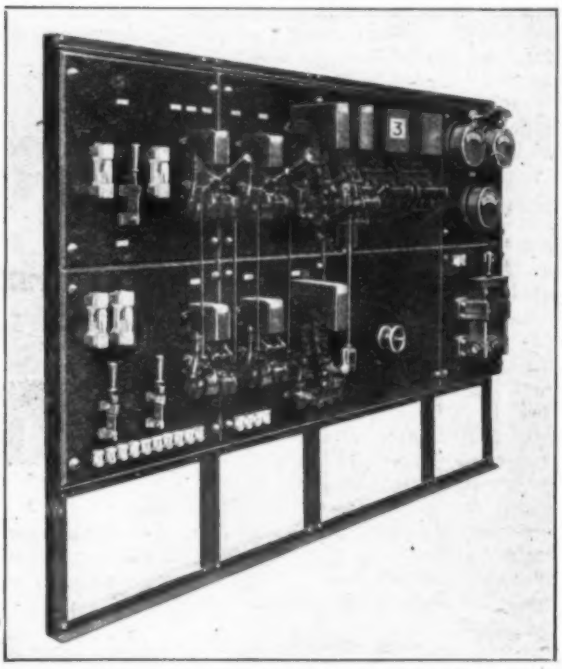


Fig. 4.—Main Starboard Switchboard (incomplete).

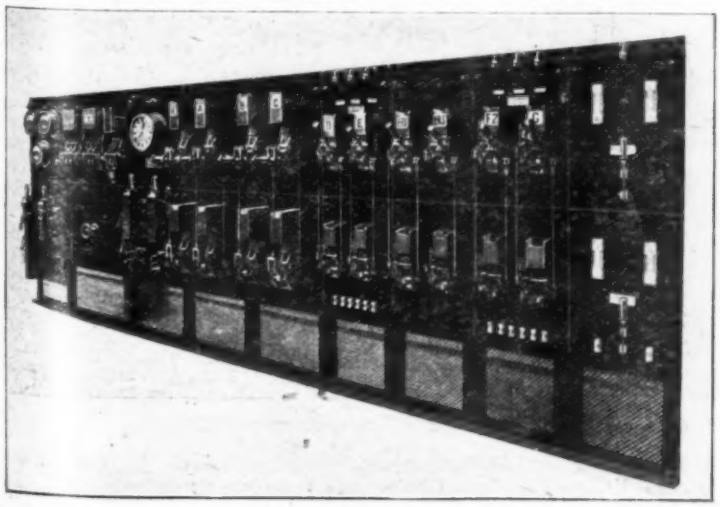


Fig. 5.—Main Port Switchboard.

comprises ten winches of 25 h.p. each, six winches of 21 h.p. each, and two aft capstans of 60 h.p. each. The boat winches comprise six of 12½ h.p. and one of 6 h.p. The steering gear is electro-hydraulic and of the Williams-Janney type; it consists of two separate units, one driven by a 60-h.p. motor and one driven by a 40-h.p. motor. Electrically, either motor can be fed from either side of the ship, or from the emergency dynamo, and the units can be used independently or together, thus giving a very elastic arrangement so far as the power available is concerned.

The refrigerating machinery includes three compressor motors, each of 110 h.p., four 8-h.p. brine pumps, one bilge pump of 2 h.p., and two water-circulating pumps

each of 8 h.p. This machinery is fed from a separate change-over switchboard in the refrigerating compartment which, in turn, is fed from either the port or starboard main switchboards. An extensive system of electric distance thermometers, by the Cambridge Instrument Co., is fitted in connection with the insulated holds. The system comprises special thermometers connected to a 36-way indicator mounted in the refrigerating engine room. The indicator is shown in fig. 7, and one of the thermometers in fig. 8.

Very special attention has been given to the ventilation of the whole of the vessel, and a large number of power fans are fitted. To cater for the comfort of the first-class passengers, a 12-in. diameter fan is provided for each berth, similar fans also being provided for the convenience of the officers of the vessel. The public rooms are ventilated by the "Punkah" louvre system, and approximately sixty large ceiling fans, each having a 54-in. sweep, are also fitted in the saloons, &c. The blower fans fitted in connection with the third-class accommodation aft are provided with "Ozonair" apparatus, which purifies and deodorizes the air before it passes through the ventilating ducts to the cabins.

turbine turning, &c., are driven electrically, and it is interesting to note that the motors fitted are capable of developing an aggregate of 1,900 h.p.

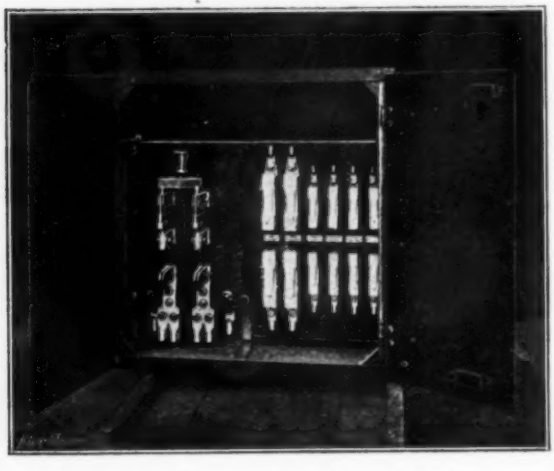


Fig. 6.—An Engine-room Auxiliary Switchboard.

Fig. 7.—A Multipoint Thermometer Indicator.

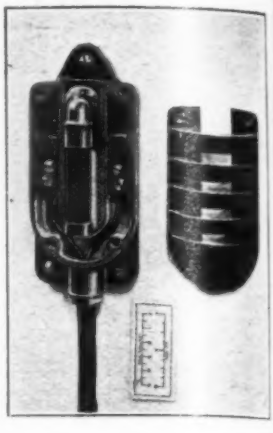
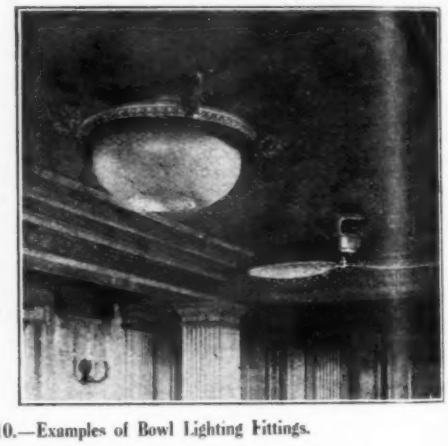


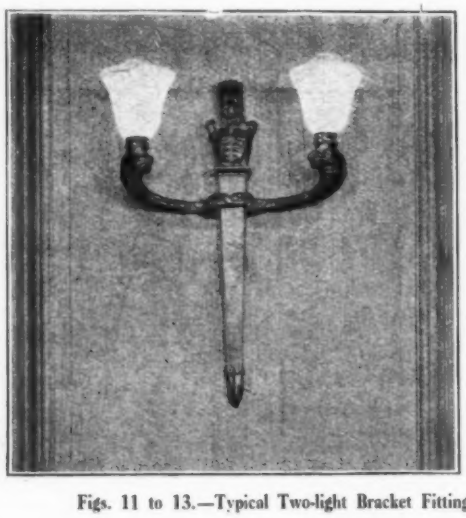
Fig. 8.—An Electric Distance Thermometer.

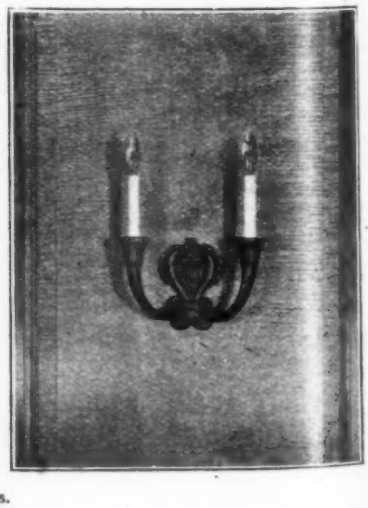
Electric radiators are fitted in the public rooms, and separate portable radiators are provided in the first-class accommodation for the convenience of passengers. The whole of the cables are of the Cable Makers'



Figs. 9 and 10.—Examples of Bowl Lighting Fittings.

Association standard 2,500-megohm grade, and have been manufactured throughout by Messrs. W. T. Glover and Co., Ltd. To avoid possible damage due to the overheating of cables, and to provide ample margin for additional apparatus and extensions, the current density of all wires has been generously calculated. For small cables the density is 50 per cent. that of Lloyd's,





Figs. 11 to 13.—Typical Two-light Bracket Fittings.

Motors are fitted for many purposes other than those mentioned; for instance, passenger elevator, stores lifts, workshop motor, printing machine, sounding machine,

and for the large sizes the percentage is between 50 and 75.

In the *Orama* the lighting has had very thorough consideration, the treatment being on generous modern lines. The convenience of the passenger and the harmony of the general effect with the decoration of the ship have been constantly in the minds of the designers, and the *tout ensemble* leaves a pleasing impression. In the cabins each passenger is provided with a berth light suitably arranged to give a soft diffused light for reading, the switch being at the side of the berth where it can be conveniently operated. The general lighting of the cabins is catered for by the fitting of pendants and brackets where necessary, two-way switching being provided where required.

The passages and staircases are generously illuminated by means of specially-designed cut-glass pendants and bulkhead fittings, and a fair proportion of the number are fed from the emergency dynamo in order to give adequate light in case of emergency. The whole of the boat deck lighting is supplied from the emergency circuit, the controls being grouped at a convenient point near the emergency dynamo room.

Figs. 14 and 15.—Potentiometer and Master Clock.

Metal-filament lamps are used throughout, and the cabin fittings are made in best white metal finished in double Elkington plate.

The first-class promenade decks are specially lighted by means of cut-glass pendants, and large clusters with cut-glass bowls are fitted in the spaces set aside for dancing. The lighting of the public rooms has been generously dealt with. In general, the fittings comprise specially designed bowl fittings, single-light pendants, and two-light candle brackets finished in "penny bronze" arranged to give a pleasing effect both from decorative and illumination points of view. The whole of the cabin and public-room lighting fittings were made by Metro-Vick Supplies, Ltd. Several of the fittings are shown in figs. 9 to 13.

In the engine and boiler rooms many high-candle-power gasfilled lanterns have been utilised to supply the main source of illumination, supplemented by a large number of sixty-watt metal-filament lamps contained in watertight well-glass fittings. For use principally in the Suez Canal a 20-in. searchlight projector is mounted on the bow, complete with the necessary diverging lenses and mirrors.

The provision of call bells on large vessels of this type is usually something of a problem, but the difficulty has been overcome in the *Orama* by the fitting of 24 bell indicators with call bells and buzzers as necessary. The whole of the indicators are fed from a central battery. A plated bell push of the switch pattern is fitted at the centre of each berth in the first-class accommodation within easy reach of the passenger. Pushes are also fitted in first- and third-class public rooms and in the officers' and engineers' quarters. In order to avoid the disturbance of passengers at night-time, due to the ringing of bells, the switching arrangements are such that the movement of a change-over switch from the "day" to the "night" position on any indicator cuts out the local buzzer, operates a movement in a master indicator fitted near the galley, and rings a large bell to call the attention of the night steward.

A system of electric clocks is fitted in the vessel, of the "Pulsynetic" type manufactured by Messrs. Gent and Co. The clocks are supplied from the 220-volt lighting circuit through a potentiometer, fig. 14, in the chart house. The master clock, fig. 15, is also fitted in the chart house under the observation of the officer of the watch, and contains automatic "advance" and "retard" mechanisms to correct the clocks at a certain time each night and compensate for the changing latitude of the vessel. In the public rooms several ornamental clocks are provided. Eight brass-cased clocks are provided for machinery spaces, &c., and twenty-four 6-in. diameter clocks having dull silvered dials and electro-plated bezels are provided for various cabins, offices, &c.

Telephonic communication for navigation purposes is given by loud-speaking "Navyphones" manufactured by Messrs. Alfred Graham & Co. A telephone instrument with a multi-way change-over switch is provided in the navigating house for communication with the forecastle head, engine room, steering gear compartment, and upper and lower docking bridges. Intercommunication between the captain and the principal offices of the vessel is catered for by a system of the Sterling Telephone & Electric Co.'s design.

The signalling system fitted in connection with the watertight doors gives a visual indication on the bridge of whether each door is open or closed.

Loud-sounding alarm bells in selected positions in the crew's, stewards', and engineers' accommodation are operated from the bridge and are intended to serve as a definite call for the crew in case of emergency. The usual alarm bells and telegraphs are fitted in connection with the engine-room equipment, and naturally the vessel is fully equipped for radio-telegraphy, the gear being of the Radio Communication Co.'s type. The capacity of the main set is 1½ kW, and the necessary emergency plant is included, together with modern direction-finding equipment.

Specification of Fans.—The necessity for fan standardisation was shown by Mr. Oswald Stott in a paper on "Water Gauge," at a meeting of the Institution of Heating and Ventilating Engineers at the Engineers' Club, London. Mr. Stott referred to the Committee set up by the Institution to deal with the subject, and thought there was no reason why the difficulties should not be pointed out, together with the fact that they might be partially avoided—pending a common method being put forward by the Committee—by stating clearly what was desired when sending out an inquiry for a fan.

Taking, for instance, a fan for induced draught in a range of boilers where the main flue to which the fan connected was, usually, much larger than the fan inlet so that the velocity was much less—the draught specified was invariably the draught required in the main flue, so that it would not do to specify, say, 1¼ inches w.g. "static" without saying that this draught was required in the main flue. Otherwise a fan would be put forward by some fan makers giving 1¼ inches w.g. "static" at the fan inlet, and the 1¼ inches w.g. would then include the "velocity w.g." at the fan inlet, giving a much less draught in the main flue.

In a ventilating plant which had a duct upon the inlet side it was advisable to state quite clearly whether the water gauge specified included that required to produce the velocity or whether it was the resistance only. If the water gauge on the *inlet* side was specified as, say, 2 inches w.g. "static" (at the fan inlet), it meant that the "velocity" w.g. had been included so that, if the 2-inch w.g. was the *resistance*, it was, pending the suggestions from the Committee, perhaps advisable to specify "against a resistance of 2 inches w.g. excluding velocity."

Heating Valve Filaments by Alternating Current.

By W. REDMAYNE.

THE development of the dull-emitter type of valve no doubt owes its rapid strides to the inconvenience of the accumulator as a means of heating the filaments of the older type of valve. A valve user in a country district is now able to use a dry battery, and to a town dweller this may be more convenient than the constant charging and carrying backwards and forwards of a heavy and "messy" accumulator, although the latter may be cheaper in the long run.

To persons having a d.c. lighting supply installed, the charging of the accumulator does not present serious difficulties, but even then the "messiness" exists.

Many corporations are changing over their existing d.c. supplies to a.c., especially in residential areas; this has happened in my own case, and I began to take an active interest in other methods of supplying the necessary energy to the filaments of my 3-valve set.

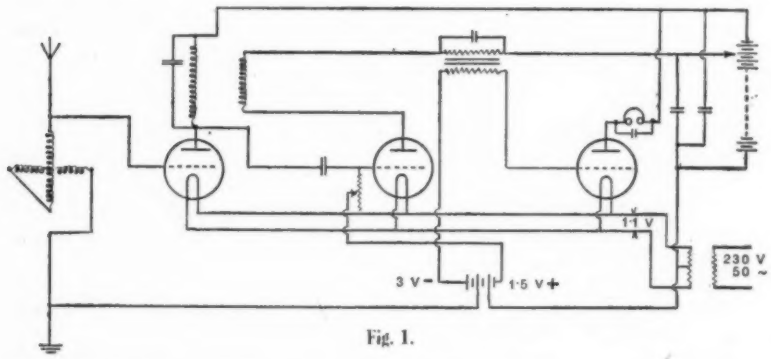


Fig. 1.

The most desirable method is, of course, to use a small transformer to step down the a.c. supply pressure to one suitable for the valves; the methods of applying such a transformer have been referred to many times, and in a particularly able manner by Mr. J. Henderson in a recent issue of the ELECTRICAL REVIEW, where its application to a valve-crystal and other sets is described. Using ordinary valves and applying + and – grid bias from the neutral point of the transformer secondary, as outlined by Mr. Henderson, fig. 1, the 50-cycle a.c. hum was very loud, and caused much distortion on my set, which is a 3-valve, h.f. (tuned anode), detector, and l.f. (transformer) arrangement. The a.c. supply was first tried without any alteration to the grid circuits, by simply connecting the transformer secondary to the 6-volt terminals of the set, and the results were awful. Dull-emitter valves requiring 0.06 ampere at 3 volts give improved results, but the hum and distortion are still very evident.

I had previously noticed, however, in experiments with Wecovalves, heated by current from an accumulator in the ordinary way, that a potentiometer, used for controlling the grids, had very little effect; also that when the filament rheostats were turned off, the reception continued for a fraction of a second afterwards. These effects seemed to indicate that this valve would work from the a.c. supply, as the ill-effects of a.c. are due to fluctuating grid potentials and filament temperatures. The Wecovalve filament takes 0.25 ampere at 0.8 to 1.1 volts, and the filament has a high "thermal inertia," to coin a term. On trying them in my set, which was then connected as for use on an accumulator, I found a very great improvement.

On making use of the mid-point tap on the transformer, and the + and – grid biasing above referred to, the results were as nearly perfect as could be desired.

Used as a 2-valve, h.f. and detector, my set did not need the grid biasing or mid-point tap; it worked very well indeed without them, a slight hum being audible during intervals in reception. This hum entirely disappeared on using 1.5 volts negative grid bias on the h.f. side and 1.5 volts positive bias on the detector grid leak.

This, however, does not apply to all 2-valve sets, particularly those in which damper plate reaction control is used or, apparently, to those in which the grid leak is connected to the earthed pole of the filament.

Using a.c. with a 3-valve set, the grid leak and reaction are very important, and the combination of howling and growling is not pleasant if reaction is pushed too far. It is unfortunate that the damper plate does not give the necessary control over reaction, as many deservedly popular sets are fitted with this device. In those sets employing a variometer with a small fixed condenser in series, for aerial tuning, it is often necessary to use "negative reaction" to control the tendency of the set to oscillate.

All this does not apply to those sets in which the detector valve is followed by one or more stages of "resistance capacity" l.f. amplification, which appears to be particularly suitable for use on a.c. supply, owing to the damping of the reaction effect by the resistance used. The transformer used for supplying the valves is one sold for ringing electric bells, costing 9s. 6d. retail, and is marked F.A. W. The 230-volt 50-cycle primary winding was left undisturbed, and the "3 plus 5 volt" secondary winding was stripped and rewound with 22 turns of No. 18 s.w.g. wire, this giving the correct pressure for operating Wecovalves, after making a little allowance for the inevitable pressure drop in the connecting wires.

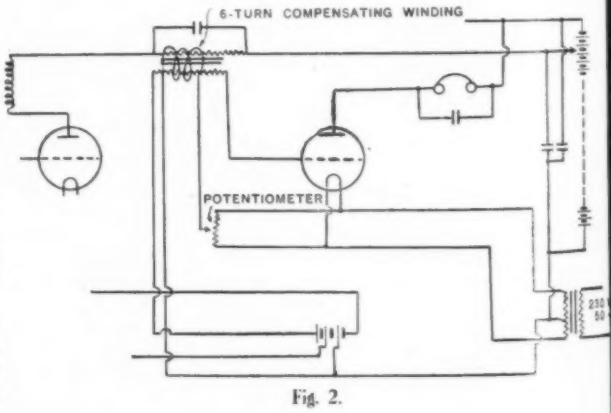


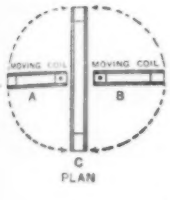
Fig. 2.

It is important that no filament resistances be used, as this unbalances the grid potentials with respect to the terminals of the filament. If regulation is desired, it is best effected by a resistance in the primary circuit, but such a resistance must necessarily be of a high value, as the current taken is small, being about .02 ampere. Any good bell transformer would answer the same purpose, and the requisite number of turns can easily be obtained by counting the existing secondary turns, and dividing by the voltage for which it has been designed, which will give the number of turns required per volt.

The consumption of these small transformers, supplying 3 valves, is negligible, being in the region of 1 kilowatt-hour in 200 hours.

It would be still more advantageous, of course, if ordinary valves could be used, as the consumption of the valve is not of much account when the public supply is available; a 4-valve set would not require more than, say, 25 watts at the transformer supply terminals = one kWh in 40 hours.

The subject opens up a very interesting field for experiments, and I have carried out a number which I will now describe. Using the 3-valve set, I noticed that during the silent periods in the programmes, or if the aerial and earth wires were removed from the set, a slight hum was audible, and this I strove to eradicate by several methods, one of which I have incorporated in my set.



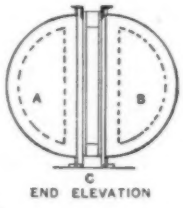


Fig. 3.

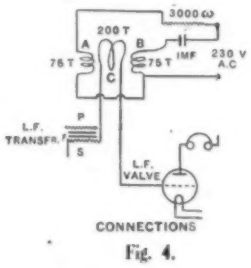


Fig. 4.

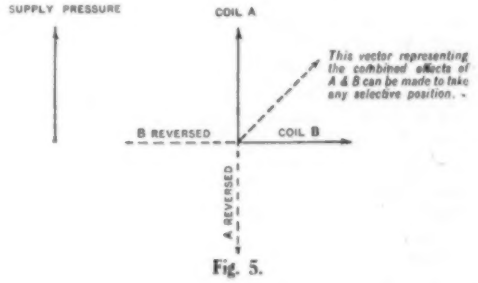

SUPPLY PRESSURE
COIL A
This vector representing the combined effects of A & B can be made to take any selective position.
B REVERSED
COIL B
A REVERSED

Fig. 5.

This method is shown in fig. 2, and consists of the addition of six turns of No. 32 s.w.g. wire, wound over the existing coils of the intervalve transformer. This was easily done on my transformer (a Ferranti) without interfering with the existing windings.

This six-turn winding is connected to a potentiometer, which is supplied by the transformer used to heat the filaments, as shown in the diagram. The current in the winding can thus be regulated in direction and magnitude, the object being to cure the hum by the injection of an e.m.f. in opposition to the e.m.f. causing the hum.

This is highly successful with the low-voltage valves, and gives a greater permissible range of reaction; it also improved the effects obtained with ordinary R and D.E. valves, but with the latter a new effect became observable. On applying the compensation, it became apparent that although the compensating e.m.f. was supplied from the same source as the troublesome e.m.f. and could be regulated in direction and magnitude, the two were not so closely related as was at first supposed; they were not in phase.

It then became necessary to devise apparatus to regulate the compensating e.m.f. in its phase relationship to that causing the hum, and I describe below the apparatus I have used, with which I have been able to compensate for the disturbance under certain conditions of reaction.

The diagram given in fig. 3 shows a home-made "double-variometer" consisting of a fixed coil C with a winding connected in the grid circuit of the last valve and two movable D-shaped coils which can be so moved as to vary and reverse their effect on the fixed coil.

The two movable coils A and B are each connected to the 230-volt 50-cycle a.c. supply, fig. 4, one through a $1-\mu F$ condenser and one through a 3,000-ohm resistance (a 20-watt lamp). The currents in the two coils are thus approximately equal, but they are not in phase, being practically 90 deg. apart in this respect.

The vector diagram in fig. 5 gives an idea of the phase relationship between the currents in coils A and B, and it will be apparent that, by the combined inductive effects of these two coils on C, an e.m.f. can be induced in the latter of any phase, and of any magnitude within desired limits.

This induced e.m.f. can be made to influence the grid potential of the last or any valve as indicated in fig. 4; the parallel connection being also possible as an alternative to the "series" shown.

With this device, used with Wecovalves, I have attained a high degree of perfection as regards silence, although absolute perfection is not possible even with valves heated by an accumulator, as my house is in unhappy proximity to four different sets of supply mains, so that an a.c. hum is uncomfortably audible, even with an accumulator, when the aerial coil is open-circuited. This extraneous power hum can, however, be compensated for to a large extent by the apparatus described.

A still further complication is involved, as in adjusting the degree of reaction it became obvious that two disturbances were at work at different frequencies. It might be expected that the disturbance due to temperature variation on a 50-cycle supply would be at the rate of 100 per second, and that due to grid potentials 50 per second, but the musical notes caused by these respective disturbances are not one octave apart as the above figures would suggest. I have not yet located the cause of this discrepancy.

The movable coils of the above-mentioned compensator could be supplied through any combination of capacity, resistance, and inductance to produce the necessary phase displacement, an alternative being to supply one from the filament transformer and the other from a "quadrature" transformer of similar ratio. Such apparatus, however, is of greater experimental than practical interest, as it is somewhat complicated.

Other points of interest have arisen in carrying out these investigations. The method of heating valve filaments works well with the Flewelling circuit, and particularly with a modification of this circuit shown in fig. 6, which is due to a friend, Mr. J. W. Treherne, and which also has advantages over the regular Flewelling circuit when an accumulator is used. No compensation or biasing is necessary with either circuit when Wecovalves are used.

I note that, according to the advertisements, the "Dextraudion" appears to have similar characteristics to the Wecovalve, and I seem to remember still another make having been advertised as requiring a low e.m.f. It should be pointed out, however, that a valve taking a low current may not be advantageous, as the "thermal inertia" is important.

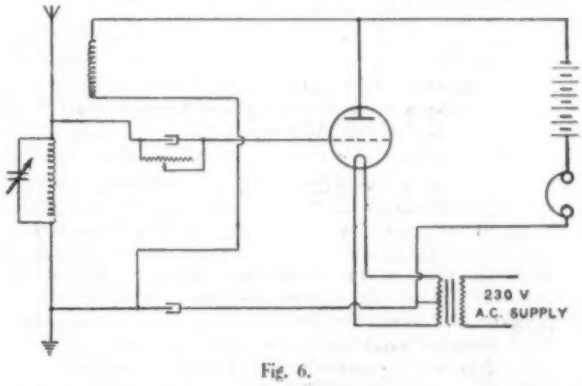


Fig. 6.

Another curious effect arose in connection with a single-valve l.f. amplifier, supplied with a.c., and amplifying the output of a set having its valve supplied in the ordinary way with d.c. The valve used was a B4 power valve, and the hum was very noticeable until the

diaphragm of the loud speaker (a "Revo") was adjusted to a position which would have been totally unsuitable for use in the ordinary way, when almost perfect reception resulted, without any compensating devices whatever. This effect would appear to depend on the natural frequency of the diaphragm.

Sets employing dual amplification with crystal rectification can easily be operated by attention to the grid connections, as described above.

A crystal rectifier appears to lend itself well to a set employing a.c. for heating the filaments of the amplifier valves.

Regarding the extra transformer winding, described as the first method of compensation, this has curious effects when it is left in circuit, and an accumulator is used in place of a.c., the grid connections being restored to normal; with certain adjustments of the potentiometer, the volume delivered by the loud speaker was increased, perhaps due to the magnetisation curve of the iron used in the transformer. It would appear to be possible to work on a straighter and steeper portion of this curve by the application of d.c. to the extra windings, thus providing an additional or reduced flux in the iron.

There appears to be a field for a valve having a short, coated metal filament, having a high "thermal inertia" and low grid potential variation. The extra watts consumed would be of no practical importance compared to the benefits derived from the ability to use a.c. to heat such a filament.

The filament of such a valve would be practically indestructible—which fact might militate against it from the makers' point of view.

I should like to suggest two other interesting experiments for those who have the necessary supply available: (1) The heating of the filaments of a 3-valve set by a 3-phase supply. The effect of the last valve might predominate, but (2) it appears to be reasonably certain, on theoretical considerations, that if the l.f. transformer secondary supplied the grids of 3 valves (used in parallel) which in turn were heated by a 3-phase supply (one phase to each valve), any ill-effects from a.c. would cancel out, whatever type of valve was used.

I shall be very interested to hear that other experimenters have had success with the methods described, and to enter into any detail I may not have made clear if the readers (and the Editors) so desire.

I have no interest in the firms whose products I have referred to; such references are made to enable readers to repeat the experiments under the same conditions as my own if necessary.

Since writing the above I have had an opportunity of testing the new Metro-Vickers dull emitter, and find that it operates quite satisfactorily on a.c.

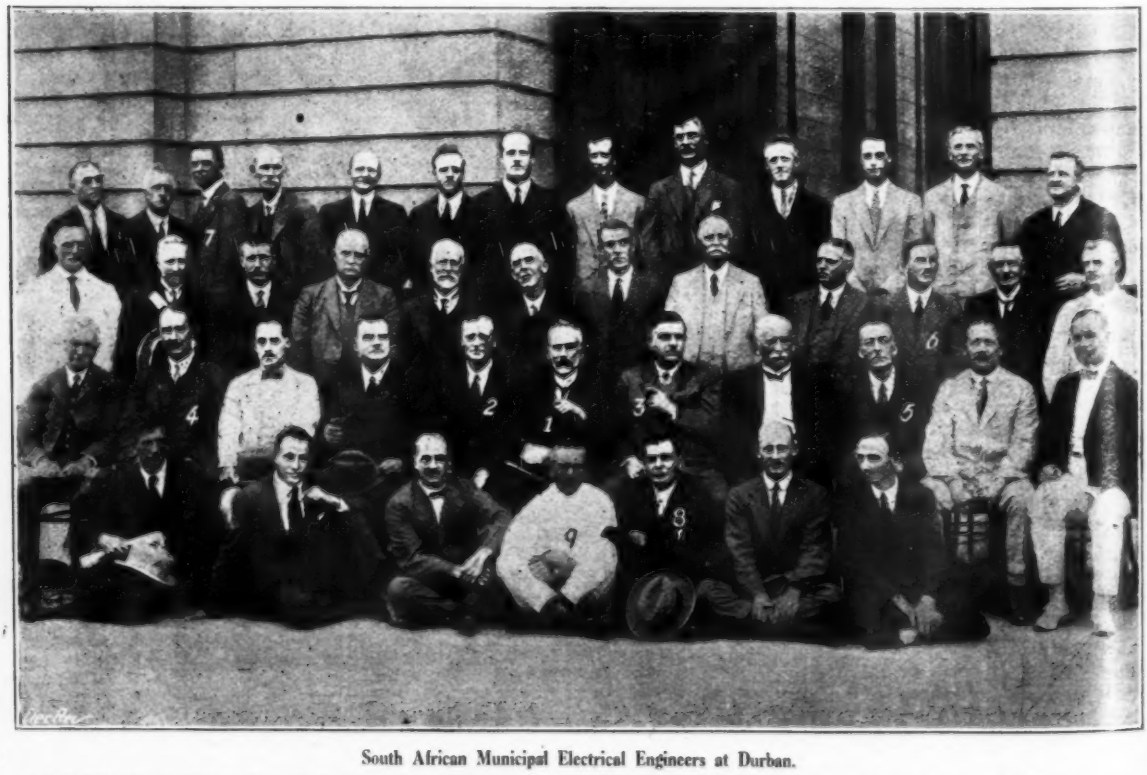
South African Municipal Electrical Engineers.

(From our Special Correspondent.)

THE sixth Convention of the Association of Municipal Electrical Engineers (Union of South Africa) was held at Durban from December 8th to 12th, and it was attended by about 50 members and councillor delegates. A group photograph with a key indicating members of Council accompanies this article.

The meetings were held in the Municipal Council Chamber, and on the opening day the Mayor of Durban extended to the Convention a hearty welcome.

The formal business was opened by the reading of a valedictory address by the retiring president, Mr. G. H. Swingler, city electrical engineer of Cape Town, who, after presenting the secretary's report and financial



South African Municipal Electrical Engineers at Durban.

1. President, Mr. J. Roberts, Borough Electrical Engineer, Durban. 2. Vice-President, Mr. B. Sankey, Manager, Gas and Electricity Department, Johannesburg. 3. Past President, Mr. G. H. Swingler, City Electrical Engineer, Cape Town. 4. Past President, Mr. T. C. Wolley Dod, City Electrical Engineer, Pretoria. 5. Mr. L. F. Bickell, City Electrical Engineer, Port Elizabeth. 6. Mr A. S. Munro, City Electrical Engineer, Pietermaritzburg. 7. Mr. T. Jagger, Borough Electrical Engineer, Ladysmith. 8. Mr. T Millar, Borough Electrical Engineer, Harrismith. 9. Hon. Sec. and Treasurer, Mr. E. Poole, Assistant Borough Electrical Engineer Durban

statement, called for nominations for president for the ensuing year. The choice fell on Mr. John Roberts, borough electrical engineer of Durban, and the following were then elected to the Council:—

Vice-President.—Mr. B. Sankey, manager, Gas and Electricity Department, Johannesburg.

Past Presidents.—Mr. G. H. Swingler, city electrical engineer, Cape Town. Mr. T. C. Wolley Dod, city electrical engineer, Pretoria. Mr. L. F. Bickell, city electrical engineer, Port Elizabeth. Mr. A. S. Munro, city electrical engineer, Pietermaritzburg. Mr. T. Millar, borough electrical engineer, Harrismith. Mr. T. Jagger, borough electrical engineer, Ladysmith.

Hon. Secretary and Treasurer.—Mr. E. Poole, assistant borough electrical engineer, Durban.

It was resolved that the next convention be held in Johannesburg in September, 1925, and Councillor Clark, representing the Johannesburg municipality, assured the members of a hearty welcome there.

The following is a list of the papers read, which brought about some very interesting discussions:—

Valedictory address by the retiring president, Mr. G. H. Swingler, Cape Town.

Presidential address, Mr. John Roberts, Durban.

"Municipal Procedure in Relation to the Trading Undertakings," Mr. Councillor Shearer, Durban; and Mr. John Roberts, Durban.

Report of World Power Conference and Wembley Exhibition, Mr. B. Sankey, Johannesburg.

"Investigation of Design, Control, and Management of Small Electric Light Undertakings," Dr. E. J. Hamlin, Stellenbosch.

"Notes on Methods of Commercial Development of Electricity Undertakings," Mr. H. A. Eastman, Cape Town.

"Notes on the Guiding Policy of the Municipal Electrical Department," Mr. F. C. D. Mann, Worcester.

Another subject dealt with during the convention was "The Standardisation of Electricity Supply Pressure," which was introduced by Mr. A. M. Jacobs, one of the representatives of the South African Electricity Commission. Opinions were very divided on the standard, there being advocates for 240, 230, and 220 volts, but a formal resolution was passed: "That the Convention approve of 220 volts as being the uniform standard pressure at the consumers' terminals for lighting supply, and 380 volts, 3-phase for power supply, and that this resolution be forwarded to the South African Standards Committee for the information of the British Engineering Standards Association, and to the South African Electricity Control Board."

Visits were paid during the week to the municipal power stations, automatic and static sub-stations, and industrial works in the district, and to the large graving dock now nearing completion. The Convention was invited to hear a paper read before the Natal Institute of Engineers by Mr. M. Dawson, of the municipal power station, on "Power Station Economy."

Other features during the Convention week were an inspection of one of the new electric locomotives which have just started running over a portion of the South African railways (Natal section); and a three-days' electrical and wireless exhibition, which especially dealt with electric heating and cooking apparatus, for which there is a large demand in Durban with its charge of ½d. per kWh. There is little doubt that the result will be a considerable increase in the demand for both apparatus and supply. The wireless exhibits attracted considerable attention, as concurrent with the other attractions of the week was the opening of the Durban municipal broadcasting station, which was equally successful. Greetings between Johannesburg and Durban were relayed over land lines and broadcast simultaneously with good results.

During the week a civic luncheon was given to the Convention party and the electrical exhibitors, and a smoking concert given by the Natal Institute of Engineers terminated one of the most successful conventions ever held by the Association.

Electrical Equipment for Retail Shops.

THE paper before the Salesmanship Conference of the British Electrical Development Association, held on January 16th, was presented by Mr. Ernest E. Sharp (of Venner Time Switches, Ltd.), and was entitled "Electrical Work in the Retail Shop and Store."

Mr. J. LEADBEATER (Borough Electrical Engineer, Hampstead) presided, and, in his opening remarks, pointed out that many of the large stores were improving their illumination considerably, and the smaller shops were inclined to follow suit.

In his paper Mr. SHARP dealt with a wide range of electric lighting, heating, and other apparatus for use in retail shops, which, however, did not exhaust this field of work, and the many other appliances which were mentioned in the subsequent discussion gave an idea of the extensive opportunities which await live electrical salesmen in this connection. Mr. Sharp confined his attention to the small and medium-sized shops, on the ground that the big stores had their own expert advisers, and rarely came to the contractor or supply undertaking for advice as to equipment.

The bulk of the paper was concerned with lighting, Mr. Sharp holding the view, which is fairly general, that at present shop lighting was very bad indeed, and offered an enormous field for profitable work. There was a need for education, and he considered that every district should have a model shop window, to which shopkeepers could be taken by electrical contractors. Shopkeepers would willingly pay for projectors, motor-driven flashers, &c., if they had an opportunity of seeing their effect, as a rule, but, if the contractor concluded that they would not, then supply authorities might well hire out this type of apparatus.

In connection with time-switches, Mr. Sharp urged that only those which switched "on" as well as "off" should be put forward, and the clock should work for eight days at least. There were many types of signs and illuminated facias which could be used with advantage, some of which were effective in day-time as well as at night, as, for instance, the "K.F.M." and the neon signs. The field for fans and small heaters for keeping windows clear of mist was extensive, and he pointed out that many of the moving appliances in shop windows could be driven electrically instead of by springs. The interiors of shops offered immense opportunities for better lighting and for small hanging and counter signs, and emphasis was laid upon the necessity for arranging that the period of extinction in flashing signs should be shorter than the light period. Too rapid changing was irritating, and, after all, the purpose of the extinction was merely to ensure attention by movement. Spot-lights could be used for lighting articles in dark corners, and the so-called "daylight" lamps and the "Mutochrome" were valuable when selling coloured articles. For heating shops he mentioned the market for electric radiators and brasiers, electrically-heated wire mats, heated screens, and mirrors.

There was a large field for cooking apparatus in restaurants and the more humble shops of this nature, and in this connection he advised those interested to visit the remarkable electric cooking installations in Marylebone. Among the various apparatus which had an advertising value for the user were X-ray apparatus in boot-shops, to show exactly how a boot or shoe fitted, and violet ray outfits in shops catering for women's needs.

Shops using electricity in any unusual form, said the speaker, should be induced to make it known generally, for it had a good advertising value for them, as well as for the electrical industry. Electrically-driven machinery used in shops should be well displayed if possible, and should be kept spotlessly clean and painted in bright colours, to show the cleanliness of the electric method.

In the ensuing discussion Mr. G. NOBBS advocated the use of electric hot-water radiators rather than electric radiant heat fires in shops, to eliminate danger of fire. In cases where each of the various floors of buildings were occupied by different shopkeepers, as was often the case in London, and central warming by means of coal or coke-fired boilers did not appeal to them, opportunities were offered for introducing electric hot-water radiators, which each shopkeeper could have under his own control. A rise of 10 or 15 deg. above the temperature of the outside air was sufficient.

Mr. H. F. SIMON suggested that if manufacturers were willing to lend apparatus to contractors for display, provided they were willing to spend a reasonable amount of money on displays in main thoroughfares, the latter would be encouraged to come out into the main streets instead of hiding in back streets. More apparatus could also be hired to contractors by supply undertakings. This should be, of course, apparatus of a fixed nature, and not the small appliances which might be knocked about.

Mr. P. M. SHEARS (Hackney) said he had experienced

trouble in connection with time-switches on account of the high initial cost, and complained that the methods of manufacture were expensive.

Mr. E. J. RILEY (G.E.C.) mentioned the sales campaign to be launched next winter by E.L.M.A. and the E.D.A., and said it had been decided to concentrate on shop-window lighting. This would educate the public, and improve the standard of lighting all round.

Mr. L. L. ROBINSON (Borough Electrical Engineer, Hackney) said that the question of glare depended to a large extent on the district in which the shops existed, and though certain shopkeepers wished to light the pavement outside their shops, it did not follow that they did not wish to light their windows also. The lighting in the window should, of course, be of higher intensity than that on the pavement, and it was a matter of comparison. In one stretch of street in his district the shopkeepers had clubbed together and demanded that he should put up 40 standards, each with 500-W lamps, the standards to be not more than 15 ft. apart. They were willing to pay him £1,000 a year for those posts, and he saw no reason why they should not have them. He regarded X-ray and violet ray apparatus as dangerous in the hands of inexperienced people. As to heating, he referred to a small restaurant in which he had put a 600-W bowl fire in each corner on the picture rail, with the rays staggered so as not to meet at one point. The effect was excellent, and the energy used was small.

Mr. H. T. YOUNG (Messrs. Troughton & Young) said that he had had difficulty in selling the better type of time-switch; customers usually wanted the cheapest. He had been able to book orders as the result of using the E.L.M.A. foot-candle-meter for demonstrating to shopkeepers that their lighting was of a low standard. Violet-ray outfits and electric radiant heat fires were not dangerous in shops. In this connection he urged salesmen not to decry one piece of apparatus when trying to sell another.

Mr. F. SELLEY (Marylebone) deprecated the pessimism which was often expressed in connection with the sale of electrical appliances, and pointed to the tremendous strides made in the application of electricity during the past 17 years. He referred to one of the largest buildings in the West End of London, which, he said, would be all-electrical within the next three months.

Mr. J. W. BEAUCHAMP (Director and Secretary, E.D.A.) said that butchers' shops offered many opportunities for better lighting. At one time they had used long gas barrels outside the shops, into which were fixed a number of flat flame burners. He had adapted some of these by screwing brass nipples into the holes previously used for the gas burners, and fixing 32-c.p., 120-W carbon lamps. Shopkeepers had been, and still were, willing to pay freely for better lighting. He disagreed with the policy of manufacturers loaning apparatus to contractors. It would probably pay a contractor to light a window for a neighbouring shopkeeper on reduced terms, if the latter displayed a notice stating that the lighting had been arranged by that particular contractor.

Mr. D. PEARMAIN said that if shopkeepers wanted lighting outside their shops, it should be in the form of scientific flood lighting.

Mr. C. HAYES was not in favour of manufacturers loaning apparatus to contractors for display purposes. The system was unhealthy, because a contractor who bought apparatus was anxious to sell it, whereas one who borrowed it did not care whether he sold it or not.

Mr. H. W. ROBERTS (G.E.C.) pointed to the opportunities existing for the sale of burglar alarms, intercommunication telephones, electrically-driven refrigerators, and fans in butchers' shops, and electrically-heated foot mats in boot shops.

The CHAIRMAN warned supply authorities against hiring out apparatus to butchers, because he had found that they paid very little respect to it, that it was always dirty, and was continually breaking down.

Mr. SHARP, in reply, expressed his objection to the practice of loaning apparatus to contractors, for the reasons already mentioned. He joined issue with Mr. Shears as to the expensive habits of manufacturers of time-switches. Competition ensured that costs were studied very closely, and apparatus was not sold if it were not worth the price charged. The percentage of cheap "off" switches which he sold at present was very small, and was rapidly diminishing. Advocating the hiring out of switches by supply undertakings, he said that, where this practice had been adopted, there had been an enormous increase in their use, and he mentioned one particular town in the North where hiring had been adopted this winter. The result was that, whereas only about 100 time-switches had been bought during two or three years previously, the supply undertaking had hired out more than 300 this winter.

Petrol-Electric 'Buses in America.—What is stated to be the largest order for motor 'buses so far given in America has just been secured by the Yellow Coach Mfg. Co., of Chicago, from the Philadelphia Rural Transit Co. It is for 250 petrol-electric 'buses; 200 of the vehicles are to be used in Philadelphia, and 50 in Buffalo. The electrical equipment is to be supplied by the General Electric Co., of Schenectady.

The Institution of Electrical Engineers.

President's Address to Western Centre.

ON January 12th a general meeting of the Western Centre of the Institution of Electrical Engineers was held at the Grand Hotel, Bristol, Mr. W. Nairn presiding.

Mr. W. B. WOODHOUSE (President) gave an address, in which he said that of all the local centres, Bristol was one of the most interesting. The members were spread over a wide field, and it reflected great credit on them that their meetings were so successful. There was a great future before the Institution, and electricity was very much in the limelight nowadays. Every modern development needed the services of an electrical engineer and as a consequence their Institution was growing in membership and importance. Engineers had been seeking a way to increase the efficiency of the steam turbine and the coal-fired boiler. One of the ideas suggested was that they should raise the temperature and pressure of the steam so as to get a larger proportion of heat available for turning into mechanical power. There they met the difficulty of materials. To attempt to work steam at a temperature exceeding 700 deg. F. was likely to lead to trouble. This automatically limited the pressure at which they could work to one which would give them a reasonably efficient steam turbine. The limit of steam pressure under present working conditions was in the neighbourhood of 300 lb. per sq. inch. To get higher efficiency they must use higher pressures in two stages. In front of their 300-lb. steam equipment they placed a purely experimental equipment working at a pressure of 1,000 or 1,500 lb. It was no good going to 500 lb., but if they went up to 1,200 lb., putting in a new type of boiler, it looked as if the savings that they could make in fuel consumption would justify that additional expenditure. To produce electricity more cheaply and to put this country in a position to compete with countries dependent on water power they must be able to use more economical processes. They could do that by building large stations.

A good deal of nonsense was talked about the price of electricity in other countries as compared with this. From the inquiries he had made, it seemed that for practical purposes Britain compared remarkably well with any country in the world. When it came to comparing a special class of supply which was dependent on a water power system, then we were not able to compete. It would be an admirable thing to have the whole supply of the country inter-connected. The difficulty was to justify the cost. Proposals had been made for all these inter-connections to be borne by the nation. Personally he never thought that necessary or advisable, because he thought they could justify these transmission lines, section by section, by agreeing to anticipate a little future growth. They were all confident that what they were doing to-day in electricity supply was merely a part of what they were going to do in the future. He considered that instead of extending a station a little at a time they should resolve that within reasonable limits it should be extended to its full economic capacity. This would justify transmission mains at once. One of the objections to the inter-connected undertakings was that the only practicable way of working was to have all of them under one ownership. In Yorkshire he believed that there were some twelve stations connected to the mains and the working of these under variable conditions was quite satisfactory, although they were not under the same ownership.

The speaker said that certain people had an idea that they were not developing a supply in the country to farmers because they were a very backward and unenterprising industry. But he did not think that the public really knew what were the difficulties. One of the chief of these was that of capital expenditure. To take a supply from an 11,000-volt line for a farmer involved an expenditure of something like £300. Another difficulty was that a farmer was a very economic user of electric light, going to bed early and getting up with the sunrise. In Denmark, a supply authority took the current to a central point and distribution mains from that centre had to be provided by the farmers. This could be done quite well here. If the farmer would jointly share the cost of the distribution mains he could have the supply. Another point was the development of agricultural industries. If only our industries could be so organised that more factories were situate in the country, it would lead to a greater use of electricity. It seemed to him that the day of the large town was over. No one could look at the traffic congestion of to-day without realising the truth of this. There would be a much more evenly spread and better housed population and a greater development of rural industry with small factories in pleasant surroundings. (Applause.)

Mr. W. A. CHAMEN, alluding to the President's reference to agricultural developments, said that instead of cramming our populations in towns under conditions which they all knew and deplored, they would be spread over the countryside and able to live in their own homes.

Electrical Commercial Travellers.

Inauguration of the New Association.

A MEETING to inaugurate the Electrical Trades Commercial Travellers' Association was held at the Lighting Service Bureau of the Electric Lamp Manufacturers' Association, at 15, Savoy Street, W.C.2, on Wednesday, January 14th. The purposes of the new body have been fully explained and discussed in the ELECTRICAL REVIEW (December 5th, 1924, p. 854, and January 2nd, 1925, pp. 3 and 15). It is intended to give support to the charitable institutions maintained by commercial travellers, and to watch the interests of commercial travellers in the electrical industry generally.

Mr. C. W. Sully (director of the E.L.M.A.) presided, and among those present were Mr. W. M. Goldsmith and Mr. A. S. Markes (chairman and secretary, respectively, of the Southern Federation of Commercial Travellers' Associations, to which the new association will probably be affiliated in due course); Mr. F. B. O. Hawes (secretary, Electrical Trades Benevolent Institution); Mr. F. Coysh (member of the Board of Management of the Royal Commercial Travellers' Schools); Mr. W. P. Lees (secretary of the Schools); Mr. Lawrence Smith (secretary of the Commercial Travellers' Benevolent Institution); Mr. A. E. Iliffe, Mr. L. G. Tate, Mr. J. W. Beauchamp, and Mr. E. F. Oldman.

The chairman said that, although he had not had the opportunity of putting the matter before the members of the E.L.M.A., his presence could be looked upon as indicating their whole-hearted support; his Association was glad to lend its rooms for the purpose of the meeting. He commented upon the wisdom of the movement, the chief objects of which seemed to be benevolence and education. He did not agree with those who considered that the object of the new Association was trade unionism.

Mr. Goldsmith dealt generally with the objects of commercial travellers' associations throughout the Kingdom, and explained that, though the primary object, when they were founded, was to support the charitable institutions maintained by commercial travellers, other matters concerning the welfare of commercial travellers came within their purview as a natural consequence of their formation. The various associations, though independent bodies, had joined together into federations for the discussion of mutual problems, and were thus able to achieve more than if they had been working entirely separately. There were five such federations in the country. A number of problems were being dealt with in this way, among them being that of obtaining a charter for commercial travellers, which would raise their status, and give their name a dignity and respect which it had not always received in the past. He was optimistic as to the success of those efforts.

A number of other speeches followed, in the course of which the representatives of the various benevolent and educational institutions already mentioned, detailed their functions and achievements. It was stated that the Commercial Travellers' Benevolent Institution and the Electrical Trades Benevolent Institution were in no sense competitive, and that they were prepared to work in co-operation in the relief of any distress that might arise. It was stated also, on behalf of the Royal Commercial Travellers' Schools, that the subscription was £1 1s. per annum, and that about £18,000 was required annually in subscriptions.

When questions were invited, both Mr. E. A. Joyce and Mr. L. Ashman complained that commercial travellers did not receive sufficient information as to the work of these various institutions, in proof of which the former stated that there were only two children of travellers connected with the electrical industry at present at the schools. He also commented on the necessity for encouraging any movement which tended to raise the status of the commercial traveller. The question of the qualifications for membership of the Association was also raised by Mr. Ashman.

With regard to the alleged lack of information available, Mr. Goldsmith and Mr. Coysh found difficulty in understanding why this should be the case, the latter suggesting that no commercial traveller worthy of the name could truthfully say that he knew nothing about the charities of the profession, and that some professed ignorance as an excuse for not subscribing.

Mr. PERCY GOOD, speaking as one who had had experience of commercial travelling in the electrical industry, warmly recommended those at present so engaged to join the Association, and to set a very high level in connection with the qualifications for joining, because, in so doing, they would raise the status of their work. The rapid growth of the industry must not be forgotten, and there would soon be many more travellers engaged in the industry than at present.

Mr. J. W. BEAUCHAMP offered, on behalf of the E.D.A., any help that he could give to the new Association. He emphasised that the incidental or secondary advantages which accrued, unnoticed and automatically, to members of such organisations were immense, and urged those concerned to utilise the arts of salesmanship in making the growth of the association rapid.

Mr. A. E. ILIFFE was of the opinion that nothing but good could come from the formation of the Association. If it could do anything to stop the wasted effort which resulted from the ranks of commercial travellers in the industry being thrown open to anyone who would like to have a try, and to improve the status of the commercial traveller in the industry, he was sure it would receive a warm welcome. He gathered that electrical firms would be invited to subscribe to benevolent funds, and urged that they should be given all the information available in that respect. He agreed that more could be done in the way of spreading information about the various benevolent institutions among commercial travellers.

On the proposition of Mr. R. F. Norris, seconded by Mr. A. S. Markes, it was resolved that the name of the association should be "The Electrical Trades Commercial Travellers' Association." It was suggested that the traveller in the electrical industry was worthy of a better title, and an amendment that the name should be "The Electrical Trades Representatives' Association" was put, but it was lost, and the original resolution was carried by an overwhelming majority.

Mr. A. S. MARKES, dealing with qualifications for membership, said that "Commercial Traveller" was defined as a person engaged in visiting tradesmen, professional men, public bodies, or persons other than householders for the purpose of securing orders on behalf of manufacturers, merchants or wholesale houses, and that no individual who travelled less than six months per annum should be eligible for membership.

Mr. R. F. Norris and Mr. F. C. Chown have consented to act as hon. secretary and hon. treasurer respectively, *pro tem.*

A resolution was carried asking Mr. Sully to accept the position of president of the Association for the first year, and he accepted the compliment on the understanding that the position was purely a nominal one.

Applications for membership were handed in by a number of those present. Rules are to be drafted for submission in due course to a general meeting of the members.

Business Notes.

Bankruptcy Proceedings.—H. H. ATKINSON, electrical engineer, 33, Prince's Avenue, Old Trafford, Manchester.—First meeting January 26th, at the Official Receiver's offices, Byrom Street, Manchester; public examination February 12th, at the Court House, Salford.

A. MEADOWS, The Arcade, Penzance, electrician.—The first meeting of the creditors was held recently at the Official Receiver's office, Truro. The statement of affairs showed gross liabilities of £400, of which £393 was expected to rank, against assets of £146, leaving a deficiency of £254. Debtor attributed his failure to insufficient capital, keen competition, and the income from his business being insufficient to meet his trade and personal expenses. He commenced business as an electrician in January, 1923, taking over his brother's business, agreeing to pay £239. It was alleged that there was a sum of £48 still owing in respect of that agreement. Early in 1919, debtor had become a partner in a firm of electricians, putting £60 into the concern, which failed two years later, a composition being effected. Debtor had offered to pay his creditors by instalments before the receiving order, but this was refused. The case being a summary one was left with the Official Receiver as trustee.

T. G. COATON (T. G. Coaton & Co.), electrical engineer, 29, Elvington Street, and 16, Humberstone Road, Leicester.—Trustee, Mr. E. H. Hawkins, 4, Charterhouse Square, E.C., released October 11th, 1924.

C. F. M. METCALF, electrical and wireless engineer, 8, Cow Green, Halifax.—Trustee, Mr. C. H. Baker, 1, Albion Street, Boar Lane, Leeds, released December 3rd, 1924.

P. BRADLEY (Bradley & Co.), electrical engineer, 16, Widemarsh Street, Hereford.—Trustee, Mr. C. T. Appleby, 26, Corporation Street, Birmingham, appointed January 12th.

Company Liquidations.—WILLIAM J. A. KEENE, LTD., 10, North End Road, Golder's Green, N.W., electrical engineers.—The creditors interested herein were called together on January 13th at the offices of Messrs. Hoale, Smith & Field, Moorgate, E.C. The chair was occupied by Mr. S. E. Smith, the liquidator in the voluntary liquidation of the company. The statement of affairs presented showed liabilities of £2,055 and assets of £1,123, from which had to be deducted £823 due on debentures, leaving net assets of £300. The chairman stated that the company was registered in 1920, with a capital of £3,020. Practically the whole of the issued shares were held by Mr. W. Keene. In October, 1923, a resolution for voluntary liquidation was passed, and a liquidator was appointed. The same month a compulsory winding-up order was made, and the Official Receiver became the provisional liquidator. On March 6th, 1924, on the representations of Mr. Keene, an order was made by the Court that all further proceedings under the winding-up order should be stayed. Apparently Mr. Keene was able to arrange some settlement with the creditors. On December 29th last a further resolu-

tion for voluntary liquidation was passed. The debentures were for £810, and were issued on September 1st, 1924. The company had been under the control of Mr. Keene from its inception, and he and Mrs. Keene were the two directors. The company really re-commenced business sometime between July and September of last year. Mr. W. A. J. Osborne, of Messrs. Corfield & Cripwell, had been appointed to act as the receiver for the debenture holder. The business was a progressive one, and it was hoped to effect a sale as a going concern at figures in excess of those appearing in the statement. There was a possibility in that event of the creditors receiving a dividend of 5s. in the £.

A creditor remarked that he had supplied the company with a large quantity of goods last September, and he asked what justification there was for such a substantial order being placed. The chairman replied that practically the whole of the liabilities had been incurred during the last few months, when the business re-commenced.

Mr. A. E. Quaife remarked that he was representing one of the old creditors who had not been paid in full.

In answer to questions, the chairman stated that under the articles Mr. Keene was entitled to £1,000 per annum, but had only received £5 a week, and was now a creditor.

Mr. W. Keene stated that he was able to get the company back by satisfying the Official Receiver. Some of the old creditors received 20s. in the £, but others did not obtain so much.

Mr. P. Wells, of the Wholesale Traders' Association, said his view was that unless an offer was submitted, the creditors should decide to have the company compulsorily wound up. Mr. Keene replied that no offer could be submitted, and in answer to further questions he stated that the gross profits in the business were about 25 per cent., while the expenses had been in the neighbourhood of £20 a week. The matter was discussed at some length, and eventually the meeting broke up without any resolution being passed.

The principal creditors are:—

	£		£
W. J. Keene	555	Lighting and General Traders, Edmundsons	62
		Ltd.	41
Associated Battery Co., Ltd. ...	20	Mercure (Paris)	222
Electric Lamp Factors	245	Mullard Radio Valve Co., Ltd.	230
Eagle Electric Mfg. Co., Ltd.	30	A. J. Stevens & Co. (1914), Ltd.	54
General Radio Co.	186	Robinson, Lionel, & Co.	84
Goswell Engineering Co., Ltd.	95	Scott Insulated Wire Co., Ltd.	22
H. J. Hunt	26	X. L. O.	43
F. W. Lowenadler	38	Rates	32

NORWOOD WHOLESALE FITTINGS SUPPLY CO., LTD.—A petition for the winding up of this company has been presented to the High Court by G. Bowerman, merchant and advertising agent, of Lambert House, 10 to 12, Ludgate Hill, creditor, and will be heard in London on January 27th.

JOHN BARTON (ROCHDALE), LTD., Rochdale, agents for and manufacturers of motor vehicles, electrical equipment, and railway and other wagons. A meeting of the creditors of the above was held recently at Rochdale. There were two liquidators of the company, Mr. W. Heywood (a director) and Mr. W. Hoyle (the late secretary). No statement of affairs was presented, but it was stated that the company was incorporated in January, 1919, with a capital of £10,000. The subscribed capital was £5,650 in £1 shares, all issued for cash. The liabilities were in the neighbourhood of £27,278, of which £3,297 was due to unsecured creditors, and the balance to loan creditors. The deficiency was £8,063. With regard to the loan creditors for £23,981, it was reported that the Blackit Motor Co., which was the parent company, had advanced £20,261.

The liquidators explained that the object of winding up the company was in order to commence business again by the formation of a new company. They were confident that the creditors would receive 20s. in the £ on their debts. A resolution was passed confirming the voluntary liquidation of the company with the present liquidators.

Dissolution of Partnership.—H. & R. BANNISTER, electrical and automobile engineers, 55, Magdalen Road, Oxford.—Messrs. R. W. and H. J. Bannister have dissolved partnership. All debts due and owing by the late firm in connection with the electrical branch of the business will be attended to by Mr. R. W. Bannister, who will continue to carry on that branch in his own name at 84, Magdalen Road, Oxford. Debts in connection with the automobile branch will be dealt with by Mr. H. J. Bannister, who will continue that branch in his own name at 55, Magdalen Road.

Deed of Arrangement.—H. PETERS (Peters Electrical Co.), Colwyn Bay. The statement of the trustee in this matter (Mr. P. W. Aston) shows assets of £647, and liabilities, after deducting £55 covered by securities, of £1,342.

Trade Announcements.—The address of MESSRS. R. STIRLING & Co. is now 85, Douglas Street, Glasgow. The 'phone number remains the same—"Central 6088."

MESSRS. A. J. WELL & Co., of Luton, Beds., are removing from Stanley Street to 53, Princess Street.

RADIO INSTRUMENTS, LTD., has appointed the following as its agents:—Manchester and district: Manchester Radio Co., Ltd., 155, Oxford Road, Manchester; Liverpool and district: B.N.B. Wireless, Ltd., 65, Renshaw Street, Liverpool; Bradford and Northern Yorkshire: F. Riddiough & Sons, Westgate, Bradford; Sheffield, South Yorkshire, and North Lincolnshire: C. E. Needham Bros. & Sons, Change Alley, Sheffield.

The name of the NEW GUTTA PERCHA CO., LTD., has now been changed to the GREENWICH CABLE WORKS, LTD. When the company was formed, 22 years ago, it was only intended to manufacture the material now known as "Pernax," but subsequently a cable-making plant was installed, and a substantial business was built up in electric wires and cables, so that the original name has become a misnomer. The Board of Trade has sanctioned the change.

The stores and offices of the SOLENOID REGULATOR CO. are now at 268, Moseley Road, Birmingham, and all correspondence should be addressed there.

VISCO ENGINEERING CO., LTD., has removed to 162, Grosvenor Road, S.W.1. Telephone: Victoria 9024. Telegrams: "Curtmit, Sowest, London."

MESSRS. ROTAX (MOTOR ACCESSORIES), LTD., have appointed the Utility Electrical Co., Grosvenor Street Works, Wednesfield Road, Wolverhampton, as their official service and battery agents for Wolverhampton and district.

The *Irish Electrician* states that the electrical department of the Austin Motor Co., Ltd., is being taken over by the AUSTIN ELECTRIC CO., LTD., which has just been formed for the purpose, and will develop the sales of automatic and semi-automatic house and village lighting plants. The organisers of the new business are the Austin Motor Co., Ltd.; the B.T.-H. Co., Ltd.; Callender's Cable and Construction Co., Ltd.; Mirrlees, Bickerton & Day, Ltd., and Mr. R. Borlase Matthews. The Austin Electric Co. will be represented in Ireland by one of the leading firms of engineers. Part of its policy will be to develop electro-farming.

Mr. W. J. WARREN, of Coleman & Warren, of Victoria Street, S.W.1, asks us to state that Mr. H. Coleman is not now connected with the firm.

Catalogues and Lists.—INDUSTRIAL COMBUSTION ENGINEERS, LTD., Astor House, Aldwych, W.C.2.—A series of illustrated catalogues dealing with "Bailey" boiler meters, indicators and recorders.

THE CAMBRIDGE INSTRUMENT CO., LTD., 45, Grosvenor Place, S.W.1.—An illustrated publication giving full details of the company's thermo-electric pyrometers of various patterns.

STERLING TELEPHONE AND ELECTRIC CO., LTD., 210-212, Tottenham Court Road, W.1.—Publication No. 409, an illustrated pamphlet advertising metal covers for Sterling "Anodion" receivers. Priced.

MESSRS. E. BROOK, LTD., Huddersfield.—A British Empire Exhibition souvenir booklet containing a number of views of applications of the company's electric motors in various parts of the Exhibition.

LUTH & ROSEN ELECTRIC CO., LTD., 75, Victoria Street, S.W.—A trilingual catalogue (English, French, and Spanish) illustrating examples of the electrical machinery and apparatus which this newly-formed company is able to supply.

MESSRS. P. L. DWYER & Co., 30, Grosvenor Road, S.W.1.—January price list of wires, cables, conduits, and other electrical materials and accessories.

MESSRS. J. A. CRABTREE & Co., LTD., Lincoln Works, Walsall.—A well-printed and illustrated pamphlet describing "Crabtree" current-saving switches. Priced.

MESSRS. PHILLIPS & TURNER, 23, Cambridge Street, Birmingham.—Illustrated pamphlets dealing with lighting fittings of various patterns—ceiling plates, bowl rings, brackets, &c.

MR. FREDERICK PRATT, 66, Victoria Street, S.W.1.—An illustrated leaflet describing a cigar lighter for automobiles.

MR. J. A. HIGGINS, 28, Park Street, Clayton, Manchester.—A pamphlet advertising lighting fittings for mines, &c. Priced.

FULLER'S UNITED ELECTRIC WORKS, LTD., Woodland Works, Chadwell Heath, Essex.—Leaflet No. 320, describing the company's "Leakfree" red-line ebonite radio panels.

STERLING TELEPHONE & ELECTRIC CO., LTD., 210-212, Tottenham Court Road, W.1.—Publication No. 407, dealing with the "Primax" loud speaker. A red-gold relief picture of the appliance forms an effective cover design.

MESSRS. KLAXON, LTD., 36, Blandford Street, W.1.—An illustrated booklet describing "Klaxon" sirens for industrial use.

MESSRS. J. & W. B. SMITH, LTD., 15-23, Farringdon Road, E.C.1.—Catalogue No. 185, containing illustrations and prices of lighting glassware, &c., of all descriptions.

MESSRS. LANDIS & GYR, LTD., Elgee Works, Windmill Road, Hampton Hill.—An illustrated leaflet advertising electricity meters for switchboard mounting.

THE BILLING TOOL CO., 303, High Holborn, W.C.1.—A priced and illustrated list of machine and hand tools, including drills, lathes, sawing machines, vices, &c.

THE CRESSALL MANUFACTURING CO., 40-41, Staniforth Street, Birmingham.—An illustrated leaflet describing the "Cressall" "unit" heater and its applications. Priced.

Tramway Company's Semi-Jubilee.—To celebrate the 25th "birthday" of the undertaking the Lanarkshire Tramways Co. recently held a dinner at Hamilton. Mr. J. C. Pollok presided, and in the course of a speech announced that the company had just completed the purchase of the business of the Scottish General Transport Co., at Coatbridge and Airdrie. This system would be linked up with the Hamilton 'bus routes and give an excellent service.

New Indian Company.—Amongst the recently formed Indian companies is the Kunley Power Co., Ltd., which has been registered at Calcutta with a capital of Rs.50,00,000.

The Nation's Food Exhibition.—At this exhibition, which is to be held at Olympia, from April 11th to May 2nd, there will be ample scope for the display of electric cooking apparatus and other electrical plant used in connection with the preparation of food. The organisers are the International Trade Exhibitions, Ltd., Broad Street House, New Broad Street, E.C.2.

E.D.A. Activities.—The British Electrical Development Association suggests that much good might be done by enclosing with the quarterly electricity supply accounts some little calendars which it has produced recently. This form of publicity is better than and practically as cheap as overprinting the account forms with advertisements, and it is certainly a more acceptable method than that usually adopted.

Encouraging Industry in Uruguay.—With a view to encouraging industrial development in Uruguay a law has been sanctioned extending certain privileges for 10 years to industrial factories and establishments installed during that period. The privileges consist of: Exemption from Customs duties on imported machinery, accessories, replacements, and instruments and apparatus requisite for the working of the same, provided that no articles imported for this purpose are manufactured in the country, and (in the case of the installation of new industries) exemption from property and licence taxes for a similar period of 10 years is also accorded.

The benefits of the law are made retroactive, and include industrial factories and establishments installed since October 12th, 1922. They may be claimed also in the case of factories and establishments already installed, which introduce reforms or extensions in their output.—*Board of Trade Journal.*

American Business with Japan.—The *Far Eastern Review* (Shanghai) says that American manufacturers of electrical apparatus are now getting approximately 80 per cent. of Japan's increasing demand for these goods, whereas the major part of Japan's electrical orders went to Germany prior to the war. Japan has undertaken the electrification of 6,000 miles of State-owned railways, for which the Government will spend about $50,000,000 a year, guarding against eventualities until this work is completed, of which sum about $3,000,000 a year will go for electrical equipment incident to the task. The Westinghouse International Co. has received an order from the Japanese Government for $1,500,000 of railway electrification equipment through Takata & Co. This order includes eight large locomotives for express service, which eventually will extend from Tokio to Kobe, about 360 miles; 10 2,000-kW, 1,500-volt rotary converters; two 2,000-kW motor-generator sets, with automatic switching equipment; and a large amount of sub-station equipment.

German Loan in the United States.—It is reported from Berlin, and is said to have since been confirmed by the directors, that the Siemens group is negotiating in New York with regard to the raising of a loan or credit of from 10,000,000 to 15,000,000 dollars.

German Engineering Industry.—According to official reports, the revival in the German machine industry continued during December, but employment does not yet correspond to the full capacity of the works. The difficult position of the industry arises from the fact that it has not reaped any benefit, but has rather suffered from the formation of the steel unions, and that the work of modernisation, which brings orders to the machine industry, is greatly impeded by the lack of capital, and difficulties regarding credit. The machinery works receive numerous inquiries regarding machines but orders are seldom given, the shortage of capital and the high rates of interest hindering the installation of modern machinery, even where it is most urgently required. In the electrotechnical industry prices rose, but the hopes of an increase in business have, up to the present, been only partly realised. The number of small machines ordered increased, while sales of larger units did not increase in proportion.—*Reuter's Trade Service* (Berlin).

Engineering Workers' Wages.—A conference between representatives of employers in the engineering industry, and of the trade unions concerned, was held on January 16th. The object of the meeting was to receive the union's reply to Sir Allan Smith's statement justifying the employers' refusal to consider an increase in wages. Mr. Brownlie, president of the Amalgamated Engineering Union, in presenting this reply, said that the unions considered that their claim should be pressed. There were signs of a revival in industry which justified a reconsideration of the men's claim. Moreover, the employers should realise that they had duties to perform towards the workers and the community, as well as investors. He asked the employers to consider good wages as a form of investment. Another point brought forward was the disparity between the rates paid to skilled and semi-skilled men and those paid to unskilled labourers. Among other speakers was Mr. J. Rowan, general secretary of the Electrical Trades Union. Sir Allan Smith agreed that some new points had been raised, and said that serious consideration would be given to them. The conference was accordingly adjourned until early in February, when it is anticipated that an offer will be made by the employers.

Sunderland Corporation has granted an advance of 10 per cent. on the basic wage to fitters engaged in the electricity department, and one of 2s. per week to fitters in the tramway department.

British Trade-mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from January 14th, 1925. In the case of foreign applications the names and addresses of the British representatives are also given:—

Glazite. No. 452,327. Class 5.—Metallic wires. No. 452,328. Class 8.—Cables for electrical purposes. No. 452,331. Class 40.—Wire covered with india-rubber. No. 453,332. Class 50.—Wire covered with asbestos. The London Electric Wire Co. & Smiths, Ltd.

Radiobat. No. 453,215.—Electric accumulators and batteries included in Class 8.—Radiobats, Ltd., 18, Snow's Fields, Bermondsey, S.E.1.

Triangular design. No. 452,967. Class 8.—Instruments and apparatus for use in radio telegraphy and telephony. Cane, Botten & Bailey, 3, Kenninghall Road, Clapton, E.5.

D.E.C.O. (shield and monogram design). No. 452,787. Class 8.—Philosophical and scientific instruments and apparatus for useful purposes. C. J. W. Hanson, 143-7, Rosebery Avenue, E.C.1.

Acrophone. No. 451,865. Class 8.—Instruments and apparatus for use in connection with radio telephony and telegraphy. Alfred Watkins, The Hut, Ryton Road, Beckbury, Salop.

TT (lettering and design). No. 451,735.—Electrical instruments included in Class 8.—Trüb, Tauber & Co., 3, Amperestrasse, Zurich, Switzerland. (Stonebridge Electrical Co., Ltd., N. Acton, W.3.)

Carbochek. No. 453,305.—All goods included in Class 8.—Ll. B. Atkinson, Great Missenden, Bucks.

Transkingformer. No. 454,261. Class 8.—Transformers for use in radio apparatus. Ellis & Sons (1923), Ltd., 6, Panyer Alley, E.C.4.

Ella. No. 449,551.—Electric fusible cut-outs, electric ignition sparking plugs, electric lamps (ordinary), electrical fittings, all being metal goods included in Class 13, but not including electrical fittings for street lighting, electrical switches, and fuse connectors. Lionel Robinson & Co.

Tixit (lettering and design). No. 454,017. Class 13.—Terminals and couplings of ordinary metal used in radio and electrical sets.—L. H. Reid, 32, Victoria Street, S.W.1.

Trojanette. No. 453,895. Class 15.—Glass. The British Thomson-Houston Co., Ltd.

Book Notices.—"The Involute and Barrel Types of Stator Winding for A.C. Electric Generators." By R. Smaller. The Association of Engineering and Shipbuilding Draughtsmen. Pp. iii+53; 28 illustrations. Price 2s.—This is a reprint of a paper on the design of stator windings, with particular reference to the angle, elevations, and coil-end construction. A chapter on "Forces acting on the end-windings on the occurrence of a sudden short circuit," although the force value is assumed, leads to an interesting description of the behaviour of both the field and stator under short-circuit conditions, and to a determination of air gap and spacing. Overhang considerations are dealt with very extensively, and the calculations are simplified by the clearly-prepared sketches and supported by examples. Calculations of slot pitch, air spacing between conductors, and insulation thickness are also considered, and methods of supporting coil-ends of both "barrel" and "involute" windings are fully described.

A similar reprint has been issued by the above Association of a paper by Mr. M. Warnock on "Foundry Practice for Draughtsmen." Pp. 38; 22 illustrations. Price 2s.

"The Electrical Engineer's Year Book, 1925." (Pp. 494 and diary.) London: S. Davis & Co. Price 21s. post free.—In the absence of a preface to indicate what changes, if any, have been made in the seventeenth edition of this comprehensive work, comparison with the last edition is very tedious work. We find, however, that the present edition includes the new I.E.E. wiring regulations and the Electricity Commissioners' regulations for overhead transmission lines. Another addition or improvement is a separate section in "The Selection and Installation of Cables" on c.t.s. cables and flexibles.

"*Journal* of the Institution of Electrical Engineers." Vol. LXVIII, No. 337. January, 1925. London: E. & F. N. Spon, Ltd. Price 10s. 6d.

"Humanism and Technology" and other essays, by Principal C. Grant Robertson and others. Pp. 91. London: Humphrey Melford Oxford University Press. Price 3s. 6d. net.

"The Elements of Railway Economics," by Sir W. M. Acworth. New edition. Pp. 216. London: Oxford University Press. 3s. 6d. net.

"Electric Cables, their Design, Manufacture and Use," by W. A. Del Mar. Pp. vii+208; figs. 58. London: McGraw-Hill Publishing Co., Ltd. Price 12s. 6d.

"Post Office Electrical Engineers' *Journal*." Vol. XVII. Part 4. January, 1925. Price 2s. net.

Trade with Germany.—The Board of Trade is informed that, although the Anglo-German Commercial Treaty has not yet been ratified, the German Government gave orders that after January 10th goods of United Kingdom production or manufacture were to receive "most-favoured-nation" treatment until further notice. Similar treatment will be accorded to goods produced in other parts of the Empire except Canada, Australia, and New Zealand, which do not accord most-favoured-nation treatment to German goods.

Swedish Foreign Telephone Orders.—It is stated that the Turkish postal administration has just placed an order with the L.M. Ericsson Co. for the supply of a telephone exchange in Angora, comprising 1,200 lines, one-half of which is to be constructed at first. The contract is said to have been secured through the intermediary of the Swedish Oriental Trading Co. of Constantinople. At the same time the Swedish company has obtained a contract for an installation of the same size and type for the Chinese town of Hang-Chow, in the province of Chekiang. The intermediaries in this case were the Ekman Foreign Agencies, Ltd., of Shanghai.

Illumination Design Courses.—In order to ensure the success of propaganda for better lighting, which the Electric Lamp Manufacturers' Association is inaugurating, it is necessary for the salesman to become a missionary of the gospel of good lighting; he must thoroughly understand lighting before he can talk about it. The first of a series of "Illumination Design Courses" was held at the Lighting Service Bureau during November last year, and was attended by a large number of salesmen of the Associated Companies of E.L.M.A. It was found that the representatives were absorbed in the subjects which were presented to them. The subject was treated in a comprehensive manner, the lectures being given by lighting specialists.

Lighting has made so much advance during the past few years that it is felt that all sections of the electrical industry would desire to have the opportunity of becoming acquainted with the most recent information available. Arrangements have therefore been made for a further series of design courses to be held as follows:—Supply Authorities, February 10th-13th; Factors, April 21st-24th; Electrical Contractors, May 12th-15th.

All who are interested are asked to communicate with the Electric Lamp Manufacturers' Association, Ltd., Lighting Service Bureau, 15, Savoy Street, W.C.2, at the earliest possible opportunity, as the accommodation is strictly limited. Should applications for attending these courses prove to be more numerous than can be satisfied, further courses will be arranged in the future.

The Danish Electrical Market.—*Commerce Reports* states that it is estimated that about 80 per cent. of the demand in Denmark for electric wiring materials and devices is supplied by the home industry which consists of about a dozen factories, exclusive of those making porcelain articles, electrical instruments, &c. Several hundred firms are engaged in wiring, and many of them also manufacture on a small scale.

The exports of electric cable exceed the imports; in 1923 these amounted to 546,900 kg., as compared with 381,400 in the preceding year. Porcelain for electrical purposes was also exported in 1923 to the extent of 43,800 kg. The material imported during 1923 was classified as follows:—Wire for electrical use, 557,700 kg.; small parts, as insulators, switches, and contacts, 134,500 kg.; porcelain for electro-technical use, 376,400 kg.; and electric cable, 488,400 kg. The overwhelming bulk of this material came from Germany, the share of the United Kingdom being very small.

Employment in Sweden.—The quarterly *Swedish Economic Review* for December states that the serious depression in the iron and steel industry continued. Employment in the machine industry rose until July last, when a retrograde movement set in which was continued up to the later months of the year. In the electrical industry, however, there was an increase in the number of men employed.

Lead.—In their letter dated January 17th Messrs. James Forster & Co. state:—"A fall in lead occurred during the week as the natural outcome of the conditions created by the high price of the metal, *viz.*, a falling off in consumption and full supplies. The Board of Trade returns for December, 1924, give imports as 21,695 tons, and exports as 1,942 tons, leaving for home absorption 19,753 tons. The last figure for the whole of 1924 totalled 210,443 tons, an average per month of 17,537 tons. Against this the monthly average for 1923 was 14,937, giving an excess for 1924 of 31,200 tons, or 18 per cent. The average (mean) official quotation for the year was £33 13s. 11d. per ton.

"The domestic (sheet and pipe) trade we estimate absorbed about 8,000 tons of the increase in imports, the total output being round about 85,000 tons, against about 78,000 tons in 1923. The outlook is for a larger consumption of lead and lead products, both in the domestic and electrical products trades, while the very high price the metal has reached cannot but stimulate production."

Lighting System for a Brazilian Town.—*Commerce Reports* states that the municipality of Acarahu, Ceara, Brazil, has been authorised to enter into an agreement with any individual or company to install an electric lighting system in that city. All correspondence, which should be in Portuguese, should be addressed to Illmo. Snr. Prefeito, Acarahu.

Accumulator Manufacture in Sweden.—The manufacture of accumulators for use in connection with motor vehicles has recently been commenced by the Nordiska Ackumulatorfabriken, of Malmo, Sweden.

Tilling-Stevens 'Buses in Czecho-Slovakia.—It is reported from Prague that the Skoda Works, of Pilsen, has received a licence for the construction of petrol-electric 'buses of the Tilling-Stevens type in Czecho-Slovakia.

Wire Lamp Patents in Belgium.—The undertaking of the Osram Gesellschaft in Belgium was sequestrated after the close of the war, and the Osram lamp patents were sold to the Société d'Electricité. A Brussels report states that the Osram Gesellschaft initiated legal proceedings on the ground that the sequestration of patents is not provided for in the Treaty of Versailles. After having passed through two of the three Courts it is now stated that the First Chamber of the Court of Appeal has reached the conclusion that the objections of the German company are valid. The legal question has now been referred to the Court of Appeal at Ghent.

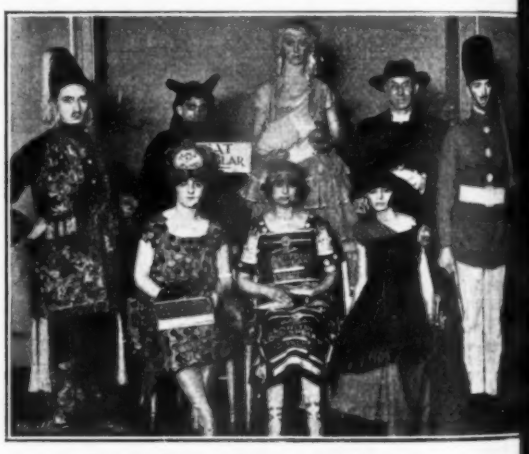
Social Events.—Mr. Arthur Cozens, electrical engineer and contractor of Sunninghill, Ascot, Camberley, and Clacket entertained his Ascot and Camberley employés and their friends, to a New Year's party and dance, on January 3rd, at Sunninghill. About 180 were present. A variety entertainment was provided by members of the staff during an interval.

The Newcastle-upon-Tyne Electric Supply Co., Ltd., held its annual staff dance on January 9th, at the Grand Assembly Rooms, Barras Bridge, Newcastle-upon-Tyne, and many well-known local people in the electrical and industrial world attended. The guests were received by the company's chairman, Mr. R. P. Sloan, C.B.E., assisted by his sister, Miss Sloan. A continuous programme of music was rendered by Tilley's orchestras under the supervision of Mr. W. Walker. All the members of the dance committee acted as M.C.'s.

The annual dinner of the staff of Fuller's United Electric Works, Ltd., was recently held at the Great Eastern Hotel, Liverpool Street, under the chairmanship of Mr. F. R. Wade, O.B.E. After the dinner an excellent musical programme, arranged by Miss Mollie Fuller, was provided.

The staff and employés of the Mullard Radio Valve Co., Ltd., were entertained by the firm at their annual dance on January 9th, held at the Royal Horticultural Hall, S.W. Seven hundred members and their friends were present. In the fancy dress parade full scope was given to prove originality in costume ideas.

The Automatic Telephone Manufacturing Co.'s Sports and Social Club held its annual carnival dance on January 10th at Liverpool. The function was well attended, some 350 being present. There was an excellent display of fancy dress



Prize-winners at the A.T.M. Dance.

costumes, many of the wearers having gone to considerable trouble to secure novel and striking effects. The prize-winners appear in the accompanying picture. The prizes were presented by Mrs. G. W. Moore. Great credit for the success of the dance is due to the M.C.'s, Messrs. Duckworth and Boyd, assisted by four stewards.

Over 120 employés of Messrs. Robson & Coleman and their friends were present at a whist drive, supper and dance, held in the Minories Assembly Rooms, Newcastle, on January 16th. Two whist drives were held, the second one being for those who did not dance. During the evening Mr. Lowrey was presented by Mr. J. Spence with a beautiful pearl pin as a mark of appreciation of a long business friendship. Music was provided by the Maxe Band.

Austro-German Tariff Reductions.—The *Board of Trade Journal* (January 15th) publishes a list showing the reduced tariffs, applicable to German goods entering Austria, under a recent "additional" commercial treaty. The reductions apply, *inter alia*, to dynamos and motors and electrical heating and cooking apparatus. It is stated that the reduced duties are applicable to similar goods of United Kingdom origin imported into Austria.

Generating Sets for P.O. Telephones.—Messrs. Stuart Turner, Ltd., have received a further order from the Postmaster-General for 60 direct-coupled generating sets for the new automatic telephone exchanges. These sets are designed to run on town's gas or petrol, and have an output of 150 W each. A contract for 70 of the sets has just been completed by the firm.

Buenos Aires Tramway Dispute.—A local correspondent of *The Times* states that the text of the findings of the legal authorities consulted by the Intendente (Mayor) of Buenos Aires in connection with the Council's decision to terminate the Anglo-Argentine Tramways Co.'s concession has been made public. It will be remembered that as a result of this contestation the Intendente vetoed the Council's resolution, and it is said that the position of the company is unassailable, while its claim on economic grounds for an increase of fares —the present rates being the cheapest in the world—is fully justified. There is, therefore, little prospect of the intervention of a third party being feasible. The terms of the offer by certain United States interests to construct a competitive system have only lately been divulged. They would have involved the city in heavy financial obligations, and were suppressed when the scheme was laid before the Council.

The International Glow Lamp Syndicate.—As has already been briefly reported, important developments have recently been taking place in the European glow-lamp industry which have led to the substitution of an international syndicate for the price convention which had hitherto existed under the title of a syndicate. The latter combination left competition in the markets free on the whole. As some of the members failed to observe the rules of the convention, the effects of the combination became illusory. As a consequence certain constituents protested against the violation of the agreement. In the case of Germany the centre of gravity of the industry lies, as is well known, with the Osram Co., which originated in 1919 through a combination of the glow-lamp interests of the A.E.G., the Siemens & Halske Co., and the Auer (German Incandescent Gas Light Company). Since then the Osram Company has extended its sphere of activity by either absorbing or assuming a large financial interest in a colliery and in glass works. Representatives of German and other interests, as recently mentioned, met in Paris a short time ago to discuss the general situation. Apart from the fixing of prices the old convention embodied a system of an interchange of patents and experience, in which the Dutch firm of Phillips is said to have participated. In order to avoid over-production it is stated that arrangements were also made at the Paris conference, when other European makers of glow lamps associated themselves with the new syndicate, for the purpose of fixing the output of each individual member. As a result of this internationalisation of the industry it is asserted that the American glow-lamp trust (apparently the United States General Electric Co. is referred to) becomes interested in the French and English lamp industries. It is noted in this connection that the German Osram Company possesses lamp factories in Norway, Poland, Czecho-Slovakia, and Spain, while its home competitors—the Julius Pintsch Company, the Bergmann Electricity Works Company, and the Radium Company—are to become members of the syndicate. Another result of the constitution of the syndicate is the reported liquidation of the sales organisation of an Austrian company and the adhesion to the syndicate of the Elektra and the Osram companies in Czecho-Slovakia.

A further regrouping of interests under the course of recent developments is announced from Switzerland. The matter refers, in the first place, to the amalgamation of the Licht A.G., of Goldau, and the Gluhlampenwerk A.G., Aarau. Both Dutch and German lamp makers were already financially interested in the latter company, and had representatives on the board of directors. The amalgamated company has now secured the majority of the shares in the Basler Gluhlampenfabrik, A.G., of Birmensdorf, and also purchased the undertaking of the Schweizerische Gluhlampenfabrik. Some of these shares have been transferred to the ownership of the Osram Company in Berlin and the Phillips Company in Holland.

It is considered that the association of the interests of the large makers of glow lamps throughout the world will be sufficient to compel the smaller undertakings also to join the syndicate in the course of time.

New French Company.—A new company has lately been formed in Paris (26, Avenue des Champs Elysées) with a capital of five million francs and the title La Société Française des Machines Electriques á Puissance Auto-Reglables, to acquire and exploit the Douloukhanoff patents relative to the automatic control of electric power installations.

Municipal Electrical Showrooms.—The Radcliffe Electricity Committee has decided to ask for an extension of tenancy of the premises now in use as showrooms. It has been reported that there has been a considerable sale of fittings, fires, stoves, kettles, and other apparatus. The results generally have exceeded expectations.

Lighting Glassware Display.—At their Farringdon Road (E.C.) showrooms Messrs. J. & W. B. SMITH, LTD., are showing a large collection of new glassware in various forms for lighting purposes. Bowls and shades of a wide variety of shapes, with a diversity of coloured and plain designs, principally floral, are on view, forming a stock from which all tastes can be satisfied. In addition to this glassware the firm shows all the usual lines of lighting fittings—shades, brackets, statuettes, standards, &c. During a recent visit we were particularly "taken" with a floor standard with a handsome metal base, the upper part of which was arranged to give a "distance" effect to garden scenes by the use of gauze panels.

Colombian Prospects.—A correspondent of the *Financial Times* at Bogota, Colombia, says that, as a whole, the country continues prosperous. The Government has spent and intends to spend a great deal of money upon railway development. The construction of an aerial tramway from Gamaria to Cucuta was to be commenced this month. There was considerable prospect of the contract for the whole of the cable (170 km.) being placed with British firms, as well as orders for some of the structural steelwork. There is strong competition from Germans and Italians, but American prices are too high for competition. Further, only American and British houses are able to give the necessary two years' credit demanded by the Government.

German Imports into New South Wales.—A note upon this subject in the *Board of Trade Journal* shows that dynamo-electric machines to the value of £1,556 were imported into New South Wales from Germany during September last.

Proposed Norwegian-German Electrode Works.—The Commercial Secretary at Oslo (Christiania) reports that, according to a notice recently appearing in the *Aftenposten*, negotiations have been carried on for some time with a German company with a view to the formation of a new Norwegian-German company to continue the manufacture of electrodes. In this connection the German company is stated to have carried on experimental operations at the factory formerly owned by A/S Norske Elektrodeverker and to have rented the factory from the Norwegian State for a period of one year from January 1st, 1925, in order to continue experimenting with a view to the subsequent formation of a new company to take over the plant and continue manufacture. It is stated that the production of the new company will far exceed that originally aimed at when the factory was first erected.—*Board of Trade Journal.*

Business Efficiency Exhibition.—This annual display, organised by the Office Appliance Trades Association, is to be held this year from February 4th to 14th at the Central Hall, Westminster.

Local Exhibitions.—NORWICH.—An Ideal Homes and General Trades Exhibition is to be held from January 28th to February 7th.

WOLVERHAMPTON.—An exhibition similar to the above is being held from February 17th to 26th. The organisers of both displays are Messrs. Hamiltons, Ltd., Granville Chambers, Bury Street, W.C.1.

CARDIFF.—The Corporation is holding an electrical exhibition until January 31st. Among the exhibits are several examples of motors and control gear for the driving of industrial machinery and radio, lighting, and domestic apparatus shown by the British Thomson-Houston Co., Ltd., and other national and local firms. Lighting fittings form another section of this company's exhibit, which includes also radio apparatus, cooking and heating appliances, &c.

"Underground" Contracts.—Tenders amounting in all to £231,000 have been accepted by the Underground Co. for the sub-surface portions of the four stations on the Clapham-Tooting section of the Morden extension. Two of the new stations—Balham and Trinity Road—will be entirely below the surface: the others—Nightingale Lane and Tooting Broadway—will have booking halls at ground level. All will be equipped with escalators. Meanwhile, excellent progress can be recorded in the driving of the new four-and-a-half mile long tunnels between Clapham Common and Merton Grove, where the line will emerge on the surface. The company expects to open the line for traffic in December of the present year.

Co-operative Societies' Electrical Development.—Co-operative societies are giving increased attention to the lighting and heating of their shops, improvements in window display being regarded as essential to the progress of the business. The Co-operative Wholesale Society has an engineering department at Manchester, which is responsible for a power station at Trafford Park, which supplies electricity to the various factories of the society on the estate there, and also drives the Sun Flour Mills. The total output for 1924 was 9,215,000 kWh. Electrical work is also being done by the department for various retail societies, including electric light and power installations at Chorley, Sheffield, Stone, Failsworth, Great Wigston, Ellesmere Port, Eccles, Glossop, Warrington, Halifax, Guiseley, Accrington, Harrogate, and Stockport, while electric lifts and heating are being installed at the premises of the Rochdale Pioneers' Co-operative Society.

The Derby Co-operative Society has opened a special department for the supply of electrical fittings and accessories to its members, including lighting and heating apparatus. This is an innovation in co-operative retail trade.

Lighting Charges in the City.—The Special Committee on Electricity Charges organised by the London Chamber of Commerce asks consumers of electricity in the City to notify it as to the difference made in their accounts since the reduction of the charges by the companies. Only lighting accounts are specified in the request.

Unemployment.—A further increase in the number of persons registered as wholly unemployed occurred during the week ended January 5th, the total then being 1,307,800—an increase of 33,900. There was thus a net increase of 40,125 during 1924.

For Sale.—By direction of the Air Ministry, Messrs. Horne & Co. will sell by auction, on January 26th, and following days, at the Air Ministry Depôt, Watford, electrical plant, machine tools and stores. Reigate Corporation Electricity Department has for disposal two 1,500-gallon oil-storage tanks. Bo'ness Corporation Electricity Supply Department invites offers for two 500-kW turbo sets, with condenser, pumps, and motor starter, two 6,000-lb. water-tube boilers, with chain-grate stokers, &c., one Green's economiser, two Weir pumps, and two Lancashire Dynamo motor generators. (See our advertisement pages to-day.)

Calendar.—MESSRS. ROPER BROS., Dublin, have sent us a calendar consisting of a block of daily slips mounted on an elliptical card, the main embellishment of which is a shamrock bearing the firm's initials.

Fire.—There was an outbreak of fire on January 12th at the premises of Messrs. E. Rivers-Smith, Ltd., electrical engineers, Hampstead, N.W., caused by the overcharging of accumulators.

Lighting and Power Notes.

Adwick (Yorkshire).—ELECTRICITY SUPPLY.—The Urban District Council has received sanction to distribute electricity, to be purchased in bulk from the Brodsworth and Collcroft colliery generating plants. 300 new houses on the Woodlands and Skellow sites have been wired for electricity.

Andover.—ELECTRICITY SUPPLY.—The Western Electric Distributing Corporation, Ltd., has informed the Town Council that it proposes commencing the electricity scheme for the town forthwith, and that a supply will be available by the autumn.

Bentley-with-Arksey.—STREET LIGHTING.—The Urban District Council has accepted the offer of the Doncaster Corporation for the supply of electricity for public lighting in the district.

Blackpool.—ELECTRICAL DEVELOPMENT.—The Mid-Lancashire Electricity Board has under consideration the electrical development of the area surrounding Blackpool, particularly Thornton, Poulton-le-Fylde, and Preesall. The Engineers' Committee is to report on the matter to the Board.

Bolton.—NEW PLANT.—The Electricity Committee has received a report from the borough electrical engineer upon the necessity of installing additional rotary converting plant at the several sub-stations in order to deal with the demand for direct current and tramway supplies, with estimates of the capital expenditure on the proposed works, including the necessary switchgear and cable connections, and has requested the Finance Committee to apply for sanction to borrow the sum of £9,800 to cover the proposed expenditure on the installation of two rotary converters and switchgear.

Bridlington.—ELECTRICITY EXTENSIONS.—The Town Council last week approved a recommendation of the Electricity Committee for an extension of the electricity works and mains at an estimated cost of about £27,000. It was stated that the London & North-Eastern Railway Co. was considering the advisability of linking up Bridlington and other towns with Hull by an electric railway.

Burnley.—PARLIAMENTARY BILL.—At a recent meeting of ratepayers, a clause for the erection of an electricity generating station, and for powers to run omnibuses, was approved. The Town Clerk explained that the amounts required for the most important provisions of the Bill were: Tramways, £12,634; omnibuses, £41,500; generating station, £205,000.

Bury (Lancs.).—LOAN.—The Town Council has applied for sanction to a loan of £3,707 in connection with the scheme for the development of electricity in the Jericho district.

Canterbury. — ELECTRICITY IN BULK. — Major Prescott-Westcar, of Herne, having applied for terms for a supply of electricity in bulk, the Town Council has offered to give a supply on the same terms and conditions as offered to Hunt and Sons, of Herne Bay. Both Major Prescott-Westcar and Hunt & Sons are applying for Special Orders to supply electricity in the Herne Bay district.

Colchester.—LOANS SANCTIONED.—The Town Council has received sanction to loans of £137,900, in connection with the new electricity station, &c., and £10,000 for mains and services.

Continental.—ESTHONIA.—Negotiations have now reached an advanced stage for the development by a British syndicate of a large hydro-electric power scheme and distribution system at the Narwa Falls in Esthonia. It is estimate that the project will cost about £2,000,000, of which sum approximately a third will be spent in Great Britain on the purchase of plant and machinery. A generating station is to be erected on a site about two miles from the falls on the Narwa River, about 10 miles from the Baltic Sea, and power will be obtained by using the water discharged from Lake Peipus. The falls, which have a drop of 60 ft., constitute the sole outlet from the lake to the Baltic.

According to the *Financial Times*, the scheme at present under consideration contemplates the development of between 60,000 and 72,000 h.p., while a smaller scheme, at a point higher up the river, which may be taken in hand at a later date, would provide an additional 20,000 h.p. The scheme has been drawn up by Mr. Alfred Dickinson, of Alfred Dickinson and Co., consulting engineers, who investigated the hydro-electric potentialities of the Narwa Falls in June, 1923, at the invitation of the Esthonia Minister of Trade and Industry. The scheme is being submitted to the Treasury in the course of the next few days.

BELGIUM.—The Société d'Electricité du Brabant, of Brussels, reports that it now holds the concession for the supply of electricity for lighting and power purposes to 26 towns and villages. To meet the increasing demand, the capital of the undertaking is being increased from 12½ to 20 million fr. for the purpose of putting down further plant at the central station at Oisquercq. A working arrangement with the Société des Centrales Electriques des Flandres has also been entered into.

FRANCE.—The Syndicat Intercommunal de la Région sud de la Forêt d'Othe has announced its intention to electrify five townships in the arrondissement of Joigny (department of the Yonne) forthwith.

A company styled the Société des Forces Hydrauliques de la Basse-Vézère, has been formed to harness various waterfalls on the River Vézère, to generate electricity. A feature of the company's programme is the creation of industries for the utilisation of the electrical energy.

The construction of a large supply network to serve 21 townships in the department of the Côte du Nord, five townships in that of Calvados, and one township in the Ardèche, Drôme and Vaucluse, was the subject of a recent conference between the Chef du Contrôle des Distributions d'Energie électrique and the Chef du Génie rural.

Dartford.—LOAN.—The Urban District Council has applied for sanction to a loan of £7,250 for the installation of an additional 750-kW rotary converter, &c.

Grange.—SPECIAL ORDER.—The Urban District Council has applied for a Special Order authorising it to supply electricity in the district.

Gravesend. — ELECTRICITY EXTENSIONS. — The Electricity Committee has adopted a recommendation of the electrical engineer that plans be prepared for a further 5,000-kW extension of plant.

Great Yarmouth.—CHANGE-OVER.—The Town Council is to change over its system of electricity supply from a.c. single-phase to 3-phase, and to install additional plant at an estimated cost of £194,476.

Hull.—NEW PLANT.—At a meeting of the Electricity Committee the Town Clerk reported that the Electricity Commissioners had given formal consent to the extension of the generating station by the installation of two 7,000-kW, 3-phase, 50-cycle turbo-alternators, five 40,000-lb. boilers, and the necessary auxiliary plant.

India.—TRICHINOPOLY.—The Trichinopoly Electric Power Co., which will supply electric power to Trichinopoly, has commenced construction work, and it is hoped that the station will be ready to begin operations early in 1926. The company expects that 4,000,000 kWh will be sold annually at about two annas per kWh.—*Reuter's Trade Service* (Bombay).

Irish Free State.—SHANNON SCHEME.—The Dail at Dublin is to reassemble for business on February 3rd, and the text of the German scheme for the development of the Shannon water power, with the report of the four Continental experts thereon, will be submitted to the House by the Minister of Industry and Commerce.

CLONMEL (Co. TIPPERARY).—At a recent meeting of the Corporation a letter was received from the Minister of Local Government sanctioning the raising of a loan of £12,750 for carrying out an electricity scheme in the town.

PEMBROKE (Co. DUBLIN).—It was reported at a recent meeting of the Urban District Council that the Ministry of Industry and Commerce was not prepared to sanction the purchase of a 500-kW Diesel set, and had recommended that the Council should purchase any additional supply required from Dublin Corporation. It was stated at the meeting that the cost of purchasing electricity from Dublin was 2d. per kWh. whereas the Council would generate it at ¾d. per kWh. The Council decided to forward the electrical engineer's report to the Ministry, and ask for sanction to the installation of the proposed plant.

Japan.—AUTOMATIC HYDRO-ELECTRIC PLANT.—The Keihin Denryoku has recently ordered from the General Electric Co. the electrical equipment for what will be the largest automatic hydro-electric power generating station in Japan. The station, to be constructed on the Oshiro River, will consist of a 3,500-kVA generator driven by a water wheel with full automatic control designed to perform automatically and in proper sequence all the operations of starting, running, and shutting down ordinarily performed by the station attendant in a manually-operated station. By simply energising the transmission line from the controlling power station, the wheel is started, the generator is synchronised, and assumes its load. The equipment includes, in addition to the usual protective device of a manually-operated station, protection against sustained overloads, hot bearings, low voltage, underspeed, overspeed, and other irregularities usually cared for by the station attendant.—*Far Eastern Review.*

TOKIO.—In order provide for additional electric power to replace that formerly generated at the two stations

of the Tokio Municipality, located at Shibuya and Shinagawa, both of which were destroyed by the 1923 earthquake, the Tokio City Office has decided to construct one large steam-driven power station as soon as a suitable site can be procured. This station will be situated along Tokio Bay, and the equipment will consist of two 5,000-kW turbo-generators, together with necessary boilers, condensers, and auxiliary power plant equipment, the cost being estimated at 1,500,000 yen. The power generated will be utilised chiefly by the Tokio street car system, but a certain amount will also be used for lighting service within the city limits. The construction of this new station will be carried out under the direction of Mr. Tojo, who is at the present time connected with the Kinugawa Hydrcelectric Co., and it is expected that the station will be in operation within two years.—*Commerce Reports.*

London.—HACKNEY.—The Electricity Committee proposes to purchase a site at Holly Street, at a cost of £2,500, for a sub-station.

Ludlow.—PURCHASE OF UNDERTAKING.—The Town Council has decided to exercise its option, under the terms of the Ludlow Electric Lighting Order, 1905, to acquire the local electricity undertaking and to give the requisite six months' notice to the company.

New Zealand.—AUCKLAND.—A report of the Corporation mentions that a contract was recently entered into between the City Council and the Auckland Electric Power Board for the installation of 1,855 electric lamps on 174 miles of principal and secondary streets. The work is in hand, and is scheduled for completion not later than March, 1927. When the complete system is in operation the city's street-lighting bill will be at least £25,000 a year.

MARLBOROUGH.—The ratepayers of the district have approved a proposal to borrow £300,000 for a hydro-electric scheme on the Waihopai River.

Northern Ireland.—BANN ELECTRICITY SCHEME.—It is stated in Belfast that there is a possibility of the Bann electricity scheme, which is in abeyance, being brought up again. There was a great deal of opposition to the scheme when it was first proposed in 1923, one of the chief objections being that the damming up of the Bann would lead to increased flooding in Armagh, Tyrone, Derry, and Antrim counties.

Paignton.—ELECTRICITY SUPPLY.—The chairman and engineer of the Paignton Electric Light Co. is to prepare a report on the proposal to obtain a bulk supply of electricity from Torquay generating station. The negotiations which have been taking place between Paignton and Torquay were suggested by the Electricity Commissioners as a preferable course to that of installing new plant at Paignton to meet the demands of next winter.

Portsmouth.—NEW PLANT.—The Electricity Committee has recommended that the power station be further extended by the installation of two 30,000-lb. water-tube boilers, and one turbo-alternator of 6,000 kW capacity, and that application be made for sanction to borrow £60,000 for the purpose.

LOAN SANCTIONED.—Sanction has been received to a loan of £50,000 for mains and services.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

CROOK (Co. DURHAM).—The Urban District Council has reduced the price of electricity to large consumers, and fixed the following scale:—From 1 to 500 kWh per quarter, 7d. per kWh; from 501 to 750 kWh, 6½d. per kWh; all over 750 kWh per quarter, 6d. per kWh.

PORTSMOUTH.—*Alternative Tariff.*—A reduction of 5s. per quarter on the fixed quarterly charges for all classes of private residences in the borough; a reduction of 5s. per kW per quarter on the fixed quarterly charge for business premises in the borough, with corresponding reduction to consumers outside the borough.

ISLE OF THANET.—*Isle of Thanet Electric Supply Co., Ltd.*—Heating and cooking: First 100 kWh per quarter, 2½d. per kWh; next 100 kWh per quarter, 2d.; beyond, 1½d. per kWh.

Scarborough.—PURCHASE OF UNDERTAKING.—The Town Council is to exercise its option to purchase the undertaking of the Scarborough Electric Supply Co., Ltd., at the earliest possible date.

Sheffield.—ELECTRICITY EXTENSIONS.—The Electric Supply Committee has approved extensions of mains and works at an estimated cost of £4,092, and extensions of mains for general distribution purposes at an estimated cost of £6,350.

ELECTRICITY IN SMALL HOUSES.—The general manager of the Corporation electricity undertaking, Mr. S. E. Fedden, has prepared a scheme for the installation of the slot meter system of electric lighting in a selected working-class district in the city. He proposes that the Corporation should provide and fix the necessary wiring installation, consisting of five 40-kW gasfilled lamps, and provide the slot meters. Adjustments would have to be made on the basis of a sinking fund to recover the cost of the installation after the consumption of 800 kWh (10 years' average at 80 kWh per annum). After 800 kWh had been registered, the meters would be adjusted to ordinary rates then in force. The scheme could be applied to any group of houses where mains are already available, but the lights installed should be restricted to rooms in constant use. The Electric Supply Committee has adopted the scheme, which was presented at the meeting of the City Council on January 14th.

GALE DAMAGE.—During the recent gale two 80 ft. cooling towers at the Neepsend power station were blown down, and the roof of the boiler house was seriously damaged.

Stafford.—NEW PLANT.—The Electricity Committee has recommended an extension of plant involving an expenditure of £45,000.

Stainforth (Yorks.).—CORRECTION.—In our last issue we stated that the Electrical Distribution of Yorkshire, Ltd., was to charge 12s. per lamp per year, plus 2d. per kWh consumed, for private lighting. The company informs us, however, that the method of charging is 12s. per *room* per year, plus 2d. per kWh.

Sunderland.—NEW PLANT.—The Corporation has received sanction to borrow £10,494 for the erection of two cooling towers at the electricity works.

Tisbury.—INCREASED CHARGES.—The Tisbury Electric Light Co., Ltd., has given notice that from January 1st the charge for electricity will be increased from 1s. to 1s. 3d. per kWh.

Torquay.—STREET LIGHTING.—The Corporation has received sanction to the borrowing of £1,500 for converting the street lamps from gas to electricity.

United States.—ELECTRICITY SCHEME.—According to the *Electrical World*, an announcement was recently made by the North American Co. that its subsidiary, the Cleveland Electric Illuminating Co., will soon begin the erection of a 300,000-kW steam station at Avon, on Lake Erie, just west of Cleveland. The station will eventually cost about $30,000,000. It will be equal in size to the company's Lake Shore station in Cleveland, which is said to be the largest steam-electric power station in existence.

The initial installation at Avon will be 67,500 kW, in three sets of 22,500 kW each. Construction will be started as soon as weather conditions permit. The plant will be an important feeder to the extensively interconnected lines of the Middle West. The Cleveland company's system is now connected with the systems of the Northern Ohio Traction and Light Co., the Ohio Public Service Co., and the Ohio Power Co., covering the industrial region of northern and eastern Ohio. The Avon station will be equipped to burn pulverised fuel, as are the Lake Shore station and two other large plants of the North American Co.'s subsidiaries—the Lakeside plant at Milwaukee and the Cahokia plant opposite St. Louis.

Wakefield.—ELECTRICITY EXTENSIONS.—The City Council has received sanction from the Unemployment Grants Committee to schemes for laying a main from Sandal district to Mornes, and the extension of mains to Flanshaw and Alverthorpe for the purpose of grants not exceeding £1,850 and £2,270 respectively, and the electrical engineer has been instructed to obtain a site and erect a sub-station at Alverthorpe. The expenditure of £1,087 for the wiring of 200 Council houses on the Lupset estate has been approved.

Walton-le-Dale.—ELECTRICITY SUPPLY.—The Urban District Council has decided to oppose the application of the Lancashire Electric Power Co. for an Order to supply electricity in the district. The objection is on the grounds that the Council itself wishes to purchase electricity in bulk from Preston Corporation. It was reported to the Council that if the company obtained the Order, it would purchase a supply from Preston.

West Bromwich.—NEW SUB-STATION.—The Town Council is applying for sanction to a loan of £3,150 for the erection and equipment of a sub-station near the Town Hall.

Worksop.—"FREE" WIRING.—The Urban District Council has adopted a scheme for supplying electricity to private residences on the "free" wiring system.

Worthing.—EXTENSION OF SUPPLY.—The Town Council is applying for a Special Order authorising it to supply electricity in the urban district of Littlehampton and certain parishes in the rural districts of Steyning West, East Preston, and Thakeham. In a report submitted to the Council, the electrical engineer stated that the estimated cost of the whole scheme was £77,459, and it was proposed to provide a supply for Littlehampton and the parishes of Rustington, East Preston, Angmering, and part of Goring-by-Sea in the first instance, the capital expenditure required for these districts being £45,743. Littlehampton already receives a supply from the Sussex Electricity Supply Co., Ltd.

Tramway and Railway Notes.

Bradford.—RAILLESS CARS.—The Tramways Committee has submitted to the Corporation a report prepared by the general manager (Mr. R. H. Wilkinson) on the proposed railless-car service to Idle and Thackley. Mr. Wilkinson stated that the cost of relaying the tramway track for a distance of about 3¼ miles would be £107,623, and recommended the adoption of railless-cars. The estimated cost of the scheme was £50,849, including £22,639 for reinstating the roads. The annual saving by using railless-cars would be £6,600, as compared with the present system.

WEEKLY PASSES.—The Corporation has decided not to issue weekly passes on the tramways after January 31st.

Clayton (Yorks.).—RAILLESS CARS.—Representatives of the Bradford City Tramways Committee recently attended a meeting of the Urban District Council to consider the route, stages and fares of the proposed railless-car service between Bradford and Clayton. Mr. R. H. Wilkinson, general manager of the Bradford tramways, said that as soon as the Bradford Bill including the necessary powers, received the Royal Assent, work could be commenced. There is already a tramway to Lidget Green, near Clayton, but the railless-car service will have a separate city terminus. It is hoped that it will be in operation in about six months' time.

Continental.—SWITZERLAND.—At the end of the present month electric trains will begin running on the Vallorbe-Brigue-Domodossola line, this being the second great international route through Switzerland to be electrified.—*Reuter* (Berne).

Halifax.—TRAMWAY EXTENSIONS.—The Town Council recently discussed the proposal of the Tramways Committee to extend a double tramway track from Skircoat Green through Dudwell Lane to the Salterhebble route. The chairman of the Committee said the cost of the proposal was £10,700. The Council carried a modified scheme of single-track extension to the end of Dudwell cutting at a cost of £1,800.

MOTOR-'BUSES.—The Town Council has approved the Tramways Committee's proposal to purchase six motor-'buses at £1,050 each, and application is to be made for sanction to borrow £6,300 for that purpose and £3,150 for future requirements.

Liverpool.—NEW ROUTE.—The City Council is applying for sanction to construct a tramway along Ullet Road at a cost of £12,946. The new route is proposed as an alternative to that of Smithdown Road, to and from Allerton and Woolton.

London.—TUBE COLLISION.—A collision occurred on January 19th on the Hampstead line near Charing Cross station. A train from Hampstead, which had just left the Strand station, ran into a train from Highgate. The driver of the rear train and the guard of the other received injuries and were conveyed to Charing Cross Hospital. None of the passengers was injured. An official statement issued by the Underground Co. states that the accident was due to "a misunderstanding on the part of the staff."

South Africa.—RAILWAY ELECTRIFICATION PROGRESS.—The *South African Power Engineer* states that, according to the latest official report dealing with the electrification of the Natal main line, the erection of the power station was nearing completion. Numbers 1 and 2 turbo-alternators had been tested, and the erection of Nos. 3, 4, and 5 was proceeding. The installation of machinery at sub-stations was in progress, that at Daimana being almost ready for testing. Work on the transmission lines and overhead equipment was going on satisfactorily. The erection of 32 electric locomotive units at Pietermaritzburg had been completed, and a further 14 were in course of erection. The testing of the equipment between Ladysmith and Chieveley was continued during the month. Trains of loads ranging from 350 tons to 1,434 tons were satisfactorily hauled.

Telegraph and Telephone Notes.

Canada.—"BEAM" RADIO-TELEGRAPH STATIONS.—A group of new stations is being erected near Montreal by Marconi's Wireless Telegraph Co. of Canada for direct communication with England and Australia by short-wave "beam" telegraphy. The transmitting stations are being established at Drummondville (40 or 50 miles east of Montreal), and the receiving stations at Yamachiche, about the same distance from Montreal, but about 25 miles north of Drummondville; the transmitting aerials for communication with England will be supported on five masts, and there will be a similar number of masts for the receiving aerials. Of the latter, three at each station have already been erected. The station communicating with Australia will have three masts for the transmitting aerial and three for the receiving aerial. The number of masts and their height in each case is determined by the wave-length to be used. The masts are of the steel lattice-work type, 300 ft. in height for the English stations and 250 ft. in height for the Australian stations, and are 650 ft. apart.

The buildings at both stations are well in hand, and a considerable amount of machinery is awaiting to be forwarded to the site for erection. The overall power required for each station will be 150 h.p. per beam, obtained from the local supply in each case; the power delivered to the anodes of the valves for each beam will be about 20 kW. The construction of the stations was started in November, and since then it has been carried out in a temperature which has frequently been 20 deg. below zero; in consequence, the workmen have had to wear gauntlets in order to prevent frost bite due to touching the cold iron.

The Canadian "beam" stations will be the first links to be forged in the new Imperial "wireless chain," and are being erected in accordance with the agreement made with the British Postmaster-General, dated July 28th, 1924, which provides that the sending and receiving sections shall be capable of working simultaneously with an aerial system so designed as to concentrate the emitted waves within an angle of 30 deg. In England both transmitting and receiving sections are to be capable of operation at the Central Telegraph Office in London by remote control, and in Montreal they will be operated by the same means from the office of the Canadian Marconi Co. in the city of Montreal. Each station is to be capable of communication at a speed of 100 five-letter words per minute each way during a daily average of 18 hours. The Canadian Marconi Co.'s programme embraces the erection of stations to collect messages from other areas and pass them to the Montreal station for transmission to other countries, and to receive messages from other countries relayed by the Montreal stations.

China.—RADIO-TELEGRAPHY.—It is authoritatively stated that the Government has instructed Mr. Yoshida, Japanese Charge d'Affairs in Washington, to propose to the United States State Department that the present chaos in China with regard to radio-telegraphy should be solved by the joint efforts of the Governments concerned. It is suggested that wireless in China should be placed under the control of America, Japan, and China.—*Reuter* (Tokio).

Paraguay.—TELEPHONE SYSTEM.—Work on the establishment of a telephone system in Asuncion was begun in September last. The system is scheduled to be in operation by May next if the Paraguayan Government agrees to make certain changes in the concession.

Russia.—BROADCASTING NEWS.—News distribution by radio has been in operation in Russia for some months, and the success in the simultaneous delivery of the service broadcast from the central station at Moscow by the Russian Telegraph Agency (the official news agency of the Soviet Government), has resulted in plans for the extension of the service, says *T. & T. Age*. Last year, as an experiment, twenty receiving installations were erected at newspaper offices within a 400-mile radius of Moscow, and it is now proposed to establish twenty additional stations covering a radius of 800 miles and serving newspapers from Archangel, on the edge of the Arctic circle, to Nikolayev by the Black Sea, and from Minsk on the western border to Samara on the Volga. The apparatus, so far, is entirely of Russian construction, having been manufactured by the Leningrad Electrical Trust, but Creed printers are now on order from London, as well as Kleinschmidt printers from New York. The Russian Telegraph Agency serves the entire Press of the Soviet Union.

Spain.—NEW SPAIN-MOROCCO CABLE.—The Spanish Telephone Co., in collaboration with an American firm, is laying a cable in the Straits of Gibraltar between Algeciras and Ceuta, with the object of linking up Madrid-Tetuan-Larache, and eventually Tangier.—*Reuter* (Paris).

The Telephone Service.—MESSAGE DELIVERY.—The Post Office has under consideration a scheme for the installation at exchanges of a message delivery department, where telephone messages could be received and noted during the temporary absence of a subscriber from his business or his home. A subscriber, forced to leave his telephone with no one to answer it, would inform the exchange, says *The Times*, and any calls for him would automatically be transferred to the message delivery room. On his return the subscriber would call up this room and be given the messages awaiting him.

CONTINENTAL SERVICE.—Negotiations are taking place between Switzerland and England for the establishment of direct telephone lines between London and Geneva, Berne, and Bâle.

ADVISORY COMMITTEE.—Sir Stephen Killik has been elected chairman of the London Telephone Advisory Committee, which includes members appointed by the City Corporation, the Port of London Authority, the London County Council, the London Chamber of Commerce, and representative commercial associations. The committee meets at the Chamber of Commerce.

Transatlantic Cables.—UNIFORM PRESS RATES.—The Commercial Cable Co. announces that, owing to the increased facilities provided by its new cable between Paris and New York, the rate for Press cablegrams has been reduced so as to conform, says the *Financial Times*, to those of the Western Union Telegraph Co. and Marconi's Wireless Telegraph Co.

United States.—SIGNAL STATION CLOSED.—The Board of Trade is informed that the Sand Key signal station, which was principally used for communicating orders to passing ships, will be closed on January 31st, after which date it will be necessary for owners to cable their instructions to local brokers at Key West, who will communicate them to ships by radio.

Radio Notes.

Australia.—NEW STATIONS.—The Queensland Government, which has decided to control broadcasting, has given an order to the Amalgamated Wireless Co. for the erection of a 5-kW station at Brisbane. It will be similar to those already installed by the company at Sydney, Melbourne, and Perth. The whole transmitting apparatus will be manufactured at the company's works in Sydney, where two "wireless and telegraph" stations for use in the Northern Territory are also being constructed.—*Daily Telegraph*.

Broadcasting Plays.—NEGOTIATION COMMITTEE.—At a recent meeting of the Entertainments Joint Broadcasting Committee at the offices of the Society of West End Theatre Managers, attended by delegates of twelve associations representing London and provincial entertaining interests, the following resolution was passed:—"It having been brought to the notice of this committee that the B.B.C. is prepared to discuss the possibility of making an agreement upon lines that might meet the objections of the entertainment industry to the broadcasting of musical and dramatic entertainments, it is resolved that a sub-committee of six be appointed to consider the matter and confer with the B.B.C."

Canada.—LICENCES.—The growth of the use of radio in Canada is shown by the fact that the total receiving licences registered in the radio branch of the Department of Marine is now over 78,000. During December 9,000 licences were issued.—*Reuter* (Ottawa).

Educational Broadcasting.—Four months ago the British Broadcasting Co. added to its activities the transmission of special afternoon lectures to schools, and the results of the experience gained are contained in a letter which the company has addressed to the local education authorities throughout the country. Nature study, music, and travel have proved the most acceptable subjects, and between now and Easter the syllabus includes half-hour talks at 3.15 p.m. It is felt that the whole success of this educational broadcasting depends upon really satisfactory reception, and with a view to assisting in this direction the company is instructing its representatives at each of the broadcasting stations to give free advice to teachers and education officials on the best and cheapest type of apparatus which can be relied upon to give satisfactory results in particular localities. The company has prepared a series of diagrams and specifications of suitable circuits for school reception, which should be of service where sets are to be constructed and not purchased, and these are available without charge for schools and education officials on application to the company's Director of Education. Sets of two, three, and four valves are included in the specifications, and the approximate cost is given in each case. Under the adult education scheme, the company has arranged a series of evening talks.

Latvia.—NEW STATION.—The resolution of the Post and Telegraph Main Administration to entrust the erection of the new broadcasting station at Riga to the French Radio-Electric Co. (Société Française Radio-electrique) has been approved by the Minister of Communications of the Latvian Republic.—*L'd T. Age.*

United States.—BATTERYLESS RECEIVING SETS.—The Bosch Magneto Corporation, of Springfield, Mass., U.S.A., is reported to be about to place on the market a valve receiving set, in connection with which the use of accumulators and high-pressure batteris will be rendered unnecessary. The sets are designed to be operated off an ordinary house electric lighting circuit, by means of a series of transformers, condensers, and rectifying units designed for the conversion of a.c. to d.c.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Australia.—SYDNEY.—March 2nd. Municipal Council. 10,000-V feeder protective apparatus.*

MELBOURNE.—March 23rd. Electricity Department. One 2,000-kW rotary converter, with transformer and accessories. Specifications from the City Electrical Engineer's office, Melbourne.

Basingstoke.—January 30th. Electricity Department. One 600-b.h.p. vertical heavy oil engine and direct-coupled dynamo. (January 16th.)

Bedford.—February 12th. Electricity Committee. Repleating, altering, and rewinding single-phase a.c. motors and the modification of motor-driven machinery, where necessary, on consumers' premises. (January 16th.)

Belgium.—February 24th. Municipal authorities of Tongres. Establishment of a transformer station. Particulars for 20 fr. from the Centrale Electrique, Tongres.

Bredbury.—February 2nd. Bredbury and Romiley U.D.C. Supply and laying of 4-core lead-covered l.p. distributor cable. (January 16th.)

Chile.—SANTIAGO.—March 2nd.—State Posts, Telegraphs and Telephones Department. Telegraph material, including copper wire, insulators, &c.*

Croydon.—March 2nd. Electricity Department. 60,000-lb. water-tube boiler equipment. (See this issue.)

Dublin.—January 23rd. Dublin United Tramways Co. (1896), Ltd. A.c. and d.c. switchgear. (January 9th.)

Finland.—HELSINGFORS.—April 1st. Government Water Power Department. Materials for the sector sluice and turbine chambers for the equipment of the hydro-electric plant at Imatra.*

Glasgow.—February 2nd. Corporation. Electric lighting installation in Govan Town Hall. Mr. R. B. Mitchell, 75, Waterloo Street.

Hull.—February 19th. Electricity Committee. Four water-tube boilers and accessories. (January 16th.)

Ilford.—January 27th. Electricity Department. One 1,000-kW la Cour motor converter; 1,500-kW rotary converter, transformer and switchgear; 660-V paper-insulated cables. (January 16th.)

India.—February 3rd. India Store Department. Electric cable. (January 9th.)

Liverpool. — January 29th. Electricity Department. Stores and materials for 12 months, including electric meters, lamps, switches, fuses, &c. (January 16th.)

London.—METROPOLITAN ASYLUMS BOARD.—January 28th. Alterations and extensions to electric lighting installations at the Western Fever Hospital, Seagrave Road. (January 2nd.)

Installation of electric lighting, power, telephones, fire alarms, and domestic bells in the three new ward blocks at Tooting Bec Hospital. (January 16th.)

Manchester.—February 2nd. Electricity Committee. Three 1,000-kW motor converters or rotary converters; 11 750-kW do. do.; five 3-wire automatic balancers; two negative boosters. (January 16th.)

Newport (Mon).—February 2nd. Electricity Department. E.h.p. and l.p. switchgear. (January 16th.)

New Zealand.—WELLINGTON.—April 14th. Public Works Tender Board. Sub-station switchgear extensions for the Lake Coleridge power scheme.*

Post and Telegraph Department. March 15th. Switches and diaphragms.*

Pontefract.—Electric lighting installation at the factory of Messrs. W. R. Wilkinson & Co., Pontefract. (January 16th.)

Rumania.—BUCHAREST.—February 3rd. Rumanian State Railways. Porcelain insulators, sleeves and plates.*

South Africa.—JOHANNESBURG.—February 11th. Municipal Council. 50-h.p. electric motor.*

Southport. — February 9th. Electricity Department. 10,000 yd. l.p. paper-insulated cables (various sizes). (See this issue.)

Tanfield (Co. Durham).—February 19th. Urban District Council. Overhead line, underground h.p. cable, and sub-station equipment. (See this issue.)

Transylvania.—TIMISOARA.—March 26th. Municipal Electricity Works. Turbo-generator, Scott transformers, h.p. feeder and accessories.*

Tynemouth.—February 10th. Electricity Department. One 250-kVA and one 400-kVA transformers. (See this issue.)

Uruguay.—MONTEVIDEO.—March 3rd. State Electricity Works. Metal-filament lamps.*

March 6th. Round steel bars, iron rods, flat iron rods, sheets, &c.*

March 9th. 4,500 meters, g.i. water tubes and 47,115 fittings for same.*

March 10th. Miscellaneous goods (including flexible steel cable, &c.).*

MONTE VIDEO.—State Electricity Works. March 16th. Porcelain insulators and brackets.*

Uxbridge.—January 26th. Urban District Council. Electric fire hooter, fire alarm call system, and 4 public fire alarm call boxes. (January 16th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Belgium.—Eight tenders—three Belgian and one each Dutch, French, Swiss, German, and British (Callender's Cable and Construction Co., Ltd.)—were submitted to the Antwerp Municipal authorities for armoured cables in connection with the electric pumps which are being installed at the Kattendyk hydraulic power station. The tenders ranged from 46,680 to 84,105 fr., the lowest being that of the Société des Cableries et Corderies du Hainaut, of Dour, one of the home concerns.

Brighton.—Electricity Committee. Recommended:—
Reversible booster and accessories for the tramway battery (£517).—Bruce Peebles & Co., Ltd.
Two 300-A, 11,000-V switch panels (£554).—A. Reyrolle & Co., Ltd.

Burton-on-Trent.—Electricity Committee. Accepted:—
Three 25-kW transformers (£165).—British Electric Transformer Co., Ltd.
Three 25-kW ditto (£142) and three 50-kW ditto (£223).—Metropolitan-Vickers Electrical Co., Ltd.

Carlisle—Electricity Committee. Accepted:—
The whole of the structural steelwork to be erected at the new generating station (£5,500).—Pratchitt Bros.

Dorchester.—Electricity Committee. Accepted:—
Cable (£247).—Johnson & Phillips.

Dublin.—Dublin United Tramways Co. Accepted:—
12 months' supply v.i.r. cables.—Deutsche Kabelwerke A. G.—*Irish Electrician*

Irish Free State.—Contracts placed by the Controller of Stores, Department of Posts and Telegraphs, December, 1924:

Cable (enamelled and flameproof).—British Insulated & Helsby Cables, Ltd.
Copper wire.—W. F. Dennis & Co.
Telephone carpieces and mouthpieces.—Turraun Rubber Co., Ltd.; North British Rubber Co., Ltd.
Electric light fittings.—General Electric Co., Ltd.; Siemens & English Electric Lamp Co., Ltd.; Cable Accessories Co.
Plating apparatus.—W. Canning & Co., Ltd.
Telephone and switchboard parts.—General Electric Co., Ltd.
Testing apparatus.—Ferranti, Ltd.
Wireless telegraph apparatus.—Marconi's Wireless Telegraph Co., Ltd.
Boxes (battery).—G. Perry & Co., Ltd.—*Irish Electrician.*

London.—LONDON COUNTY COUNCIL.—Education Committee. Accepted:—

Installation of electric lighting, fire alarms, and domestic bell system at Acre Lane Home, Brixton (£127).—Jenner Light & Power Co., Ltd.

AIR MINISTRY. Accepted:—

Siemens electric lamps.—Siemens & English Electric Lamp Co., Ltd.

LONDON, MIDLAND & SCOTTISH RAILWAY. Accepted:—

6 months' supply of Siemens gasfilled lamps.—Siemens & English Electric Lamp Co., Ltd.

Portsmouth.—Tramways Committee. Recommended:—

Supply of 1,100 tons B.S.S. No. 3 tramway rails (£10,120).—Bolckow, Vaughan & Co., Ltd.

Corporation. Accepted:—
E.h.p. cable for extending the ring main in the borough:—

	12,000 yd. of .075 sq. in. h.p. cable (armoured).	620 yd. of .075 sq. in. h.p. cable (lead-cov'd)
Johnson & Phillips, Ltd. (Accepted.) ...	£7,294	£324
British Ins. & Helsby Cables, Ltd.	7,385	320
W. T. Glover & Co., Ltd.	7,390	330
Pirelli-General Cable Works, Ltd.	7,404	329
W. T. Henley's Telegraph Works Co., Ltd.	7,440	329
Callender's Cable & Cons. Co., Ltd.	7,512	336

Electricity Committee. Recommended:—

Two 1,000-kW rotary converters (£7,357).—General Electric Co., Ltd.
One 200-kW rotary converter (£1,122). For the necessary switchgear (£1,275).—English Electric Co., Ltd.

Cables:—

	500 yd. .05 sq. in. concentric cable.	500 yd. .0295 sq. in. concentric cable.	600 yd. .0236 sq. in. twin l.p. cable.
Johnson & Phillips, Ltd. (Accepted.)	£136	£78	£72
Enfield Cable Works, Ltd.	138	79	74
British Ins. & Helsby Cables, Ltd. ...	138	79	73
W. T. Glover & Co., Ltd.	138	79	73
Callender's Cable & Cons. Co., Ltd. ...	139	79	74

	3,000 yd. of .0145 sq. in. twin cable.	2,000 yd. of .06 sq. in. twin cable.
Johnson & Phillips, Ltd. (Accepted.) ...	£438	£516
Pirelli-General Cable Works, Ltd.	444	524
British Ins. & Helsby Cables, Ltd.	444	523
Enfield Cable Works, Ltd.	444	523

South Africa.—DURBAN.—Municipal Council. Accepted:—

Two 250-kVA, 3-phase transformers (£397); 1¼ miles cable and 35 miles weatherproof wire (£1,421); 200 double-pole ironclad fuses (£79).—T. Barlow & Sons, Ltd.
Twelve 250-kVA, single-phase Scott-connected transformers (£2,064).—Bartle & Co., Ltd.
288 100-amp. switch fuses (£275).—British General Electric Co., Ltd.
15 miles cable (£12,426).—H. Davies & Co., Ltd.
100-kW rotary-converter, transformer, and switchgear (£681); 2 e.h.p. truck-type switch cubicles (£313).—English Electric Co., Ltd.
4¾ miles of cable (£1,844).—R. D. Lavery & Co., Ltd.
25 miles 3-core pilot cable (£4,331); 50 joint boxes (£47).—Pirelli-General Cable Works, Ltd.—*South African Power Engineer.*

CAPE TOWN.—Electricity Committee. Recommended:—

1,000 street-lighting fittings (£1,275).—Rice & Diethelm, Ltd.
3,000 cross arms, 5,000 spindles, 3,000 sets straps and bolts, 4,000 fly fuses (£817).—Hubert Davies & Co., Ltd.
6,000 bolts and nuts, 5,000 round-top insulators, 10,000 large shackle ditto, 10,000 sets straps and bolts, 5,000 swan-neck pins (£894).—Griffin Engineering Co. Ltd.
3,000 insulators (£48); 32 tons stranded bare copper wire (£2,878); 1,000 small fly fuses (£21).—Telegraph Mfg. Co., Ltd.
18 tons bare copper wire (£1,470).—W. T. Henley's Telegraph Works Co., Ltd.

VICTORIA FALLS AND TRANSVAAL POWER CO., LTD. Witbank power station contracts.

With further reference to the note on p. 942, ELEC. REV., December 19th, 1924, contracts totalling about £660,000 have been placed in connection with the construction of the super-power station at Witbank. The following are the principal items, the approximate amounts being given in each case:—

Transformers and switchgear (£250,000).—Metropolitan-Vickers Electrical Co., Ltd.
Boiler equipment (£250,000).—Babcock & Wilcox, Ltd.
Turbines and condensing plant (£160,000).—C. A. Parsons & Co.—*South African Power Engineer.*

Stafford.—Town Council. Accepted:—

Installing electric light in 84 houses on the Lammascote Estate.—Mr. W. Hampton.

Weymouth.—Corporation. Accepted:—

Complete installation of telephones at the Weymouth Borough Sanatorium.—W. Smith & Son.

Whitehaven.—

Electrical installation at St. Begh's Church.—T. S. Bell & Co.

Forthcoming Events.

Birmingham Electric Club.—Friday, January 23rd. At the Grand Hotel, Colmore Row. At 7 p.m. Presidential address by Mr. F. R. Unwin.

Northampton Engineering College Engineering Society.—Monday, January 26th. At the Institute, St. John Street, E.C. At 5.30 p.m. Paper on "The Properties and Uses of Monel Metal," by Mr. C. A. Packer.

Institution of Electrical Engineers.—INFORMAL MEETING.—Monday, January 26th. At the Institution, Victoria Embankment, W.C. At 7 p.m. Discussion on "The National Physical Laboratory and its Work," to be opened by Mr. S. W. Melsom.

(Mersey and North Wales (Liverpool) Centre).—Friday, January 30th. At the University Club. Annual dinner.

(North-Eastern Centre).—Monday, January 26th. At the Armstrong College, Newcastle-on-Tyne. At 7.15 p.m. Paper on "The Use of Induction Regulators in Feeder Circuits," by Mr. L. H. A. Carr.

(North-Midland Centre).—Tuesday, January 27th. At the University, Leeds. At 7.30 p.m. Faraday Lecture on "World-Wide Radio-Telephony," by Prof. G. W. O. Howe.

(South-Midland Centre).—Wednesday, January 28th. At the Midland Institute. At 7 p.m. Lecture by Prof. G. W. O. Howe on "World-Wide Radio-Telephony."

(North-Western Students' Section).—Tuesday, January 27th. At the Milton Hall, Manchester. At 7.30 p.m. Paper on "Compromises in Commercial Electrical Design," by Mr. E. A. Hanney.

Royal Society of Arts.—Monday, January 26th. At John Street, Adelphi, W.C. At 8 p.m. Cantor Lecture on "Radiological Research," by Mr. V. E. Pullen.

Wednesday, January 28th. At 8 p.m. Paper on "The Electrical Equipment of the London County Hall," by Mr. C. A. Baker.

Illuminating Engineering Society.—Tuesday, January 27th. At the Royal Society of Arts, John Street, Adelphi, W.C. At 8 p.m. Discussion on "The Effect of Internal Obstructions on the Performance of a Lighting System," to be opened by Mr. J. W. T. Walsh.

Institute of Welding Engineers.—Thursday, January 29th. At Caxton Hall, Westminster, S.W. At 8 p.m. Paper on "The Philosophy of Welding," by Sir W. Peter Rylands.

Royal Institution of Great Britain.—Thursday, January 29th. At the Institution, 21, Albemarle Street, W. At 5.15 p.m. Lecture on the "Properties and Structure of Quartz," by Sir Wm. Bragg, F.R.S.

Junior Institution of Engineers.—Friday, January 30th. At 39, Victoria Street, S.W. At 7.30 p.m. Paper, "Notes on High-Voltage Electrical Transmission," by Mr. E. Ambrose.

Manchester Association of Engineers.—Friday, January 30th. At the Engineers' Club. Paper on "Superheat and Superheaters," by Mr. J. R. Hannan.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of makers or suppliers of:—

Electric table fountains.

We should also be glad to learn the present address of MESSRS. NORMAN DIXON & PRINGLE (electric drill makers).

Notes.

The St. Paul's Cathedral Appeal: Response by Electrical Companies and Others.—The following contributions appear in the list of amounts received by *The Times* in response to its appeal for funds for the repair work which has become so urgently necessary for the preservation of St. Paul's Cathedral:—

Underground Electric Railways of London ...	£1,050 0 0
Associated Telegraph Companies, of Electra House	315 0 0
City of London Electric Lighting Co., Ltd. ...	262 10 0
General Electric Co., Ltd.	210 0 0
British Thomson-Houston Co., Ltd.	105 0 0
W. T. Henley's Telegraph Works Co., Ltd. ...	105 0 0
Telegraph Construction & Maintenance Co., Ltd.	100 0 0
Alfred Herbert, Ltd.	100 0 0
Indo-European Telegraph Co., Ltd.	52 10 0
Falk, Stadelmann & Co., Ltd.	26 5 0
Sir Oliver Lodge	10 10 0
London Electric Wire Co. & Smiths, Ltd. ...	10 10 0
Admiral Sir Henry Jackson and Lady Jackson	10 10 0
J. & E. Hall, Ltd.	10 0 0
Mr. W. H. Patchell	3 3 0
Mr. and Mrs. A. Gallenkamp	2 2 0

Fatality.—An employé at the Salford Corporation's power station, Harold Day, received a fatal electric shock while engaged in cleaning 33,000-V switchgear on January 15th.

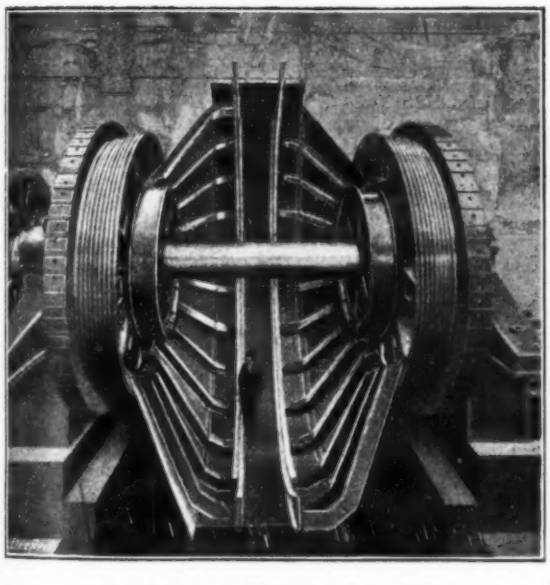
National Association of Supervising Electricians. — The tenth annual dinner and musical evening of the Association will take place on February 14th at the Holborn Restaurant. Among those who will attend the dinner are: Sir R. Burton Chadwick, M.P., Parliamentary Secretary to the Board of Trade; the Rt. Hon. J. R. Clynes, M.P.; Mr. A. Page, M.I.E.E., Electricity Commissioner and Vice-President of the I.E.E.; Mr. J. S. Highfield, M.Inst.C.E., M.I.E.E.; Major T. Vincent Smith, M.C., M.I.E.E.; and Mr. W. E. Highfield, M.I.E.E., Vice-Presidents of the N.A.S.E. The chairman will be Mr. F Gill, M.Inst.C.E., M.I.E.E., President of the Association. Applications for tickets should be sent to the General Secretary of the N.A.S.E., at 43, Russell Square, W.C.1, not later than February 2nd.

Appointments Vacant.—Charge engineer for the Worcester City Council Electricity Department. Assistant consumers' engineer for the County Borough of Barnsley Electricity Department. Overhead linesman for the Northampton Corporation Tramways. Turbine room superintendent and maintenance engineer, for the Wolverhampton Corporation Electricity Department. (See our advertisement pages to-day.)

Birmingham Tramway Celebration.—Last week the City of Birmingham tramway system reached its 21st "birthday," and the occasion was marked by a dinner given by Ald. Ellaway, the chairman of the Committee. Mr. Alfred Baker, general manager, acknowledging a souvenir gift of a gold cigarette case, stated that along the main routes there would be further extensions in a number of rapidly growing suburban districts. The 'bus system was the largest Corporation system in the country, and he entertained the hope that it would be possible gradually to establish a triple ring service of omnibuses encircling Birmingham, these being in addition to the electric tramways and the railless cars on the Nechells route. His suggestion was for an outer service, dealing with the far-flung suburbs, then an inner circle, and next a central circle about a mile from the Market Hall.

The Harworth Colliery Winder.—A short time ago we mentioned that the Metropolitan-Vickers Electrical Co., Ltd., had installed at the Harworth Colliery, Yorks., a winder capable of developing a peak of 6,000 h.p., driven by two electric motors supplied from a turbo-generator regulated on the Stubbs-Perry system, which employs steam engines in conjunction with mixed-pressure turbines.

We have now received a full description of the plant from the Metropolitan-Vickers Co., and among the illustrations is that reproduced herewith. This shows in a very striking manner the size of the winding drum, and the method of construction. With the exception of the drum cheeks, which are of cast iron, the drum is built up of steel plate. The large cylindrical portion is 26 ft. in diameter over the lagging, and 75 in. wide between the flanges. It is made in four parts



A Large Winder at Harworth Colliery, Yorks.

of 1-in. plate, stiffened internally by two pairs of 15-in. by 4-in. channels arranged back to back, and is united to the scroll plates by 6-in. x 6-in. angles. The drum cheeks have eight drums cast integrally with the brake paths, and small-diameter starting portion. They are made in halves united by two 4-in. bolts and four shrink keys recessed in the bosses, which are 46 in. in diameter and 28 in. wide. The brake paths on each side of the drum are 16 ft. in diameter and 12 in. wide. The twin brakes, of the post type, are applied by means of a weight, and are operated by compressed air. The drum shaft is made in two parts, between which the spur wheel is sandwiched. Its overall length is 33 ft., and the diameter from 26 in. in the drum cheeks to 24 in. at the centre.

Workers' Welfare at Glasgow.—At a recent meeting of the Scottish Industrial Welfare Supervisors' Society, Mr. A. M. Estcourt, of the Glasgow Corporation Electricity Department, addressed the members on the subject of municipal employés' welfare, with particular reference to the scheme adopted by the Electricity Department. Mr. Estcourt stated that at the beginning of 1919, the Glasgow Corporation approved and sanctioned the inauguration of Whitley Works' Committees throughout the various departments. Details of the personnel of the works, sectional and joint committees were given, and, in referring to their successful labours, the speaker suggested that to carry the idea a stage further a Corporation Whitley Council might eventually be formed out of the various departments of the Glasgow Corporation. Emphasis was laid on the fact that employment management was part of the industrial welfare movement, and that the two developments were springing up side by side. The training of disabled ex-Servicemen was referred to on the educational side of the scheme, and it was worthy of note that 8 per cent. of the total employés in the Electricity Department was disabled ex-Service men. An excellent technical library and recreational clubs had been established. Touching on the financial side of the question, the speaker said that it was felt that, in the near future, welfare charges would be recognised as part of industrial management costs. The example of the mining industry in placing a levy of one penny per ton on output was cited as a lead worthy of emulation. A similar levy might be introduced into the electricity supply industry for the development of welfare.

Awards to Inventors.—COMMISSIONERS' REPORT.—The third report of the Royal Commission on Awards to Inventors is now published, and can be obtained from H.M. Stationery Office direct or through any bookseller, price 6d. net. It covers a period from August, 1922, to July, 1924, during which the Commission sat on seventy-eight days and dealt with ninety-three cases, while the investigating committee dealt with 204 claims. The cost of the Commission from September, 1922, to August, 1924, was £5,647.

Electrical manufacturers, engineers, &c., figure prominently in the list of awards, the principal of which are as follows:—

The Poulsen Wireless Telegraph Co., Ltd., for the Poulsen arc system of continuous-wave wireless telegraphy	£5,000
Prof. J. G. Gray, for stabilising gear	2,900
Mr. W. H. Wilson, for wireless transmitting sets... (in addition to £6,020 already received from the Admiralty and War Office).	500
Messrs. Vickers, Ltd., for improvements in breech mechanisms for guns	61,000
Prof. F. Horton, for helium-filled thermionic valves (in addition to £157 10s. already received from the Admiralty).	£142 10s.
Messrs. W. H. Allen, Sons & Co., Ltd., for a system of air supply to boiler rooms of ships	7,500
The Submarine Signal Co., for "Fessenden oscillators"	7,500
Admiral R. S. Phipps-Hornby, for improvements in apparatus for searchlight and gun control	3,000
Dr. T. F. Wall, for apparatus for the wireless control of vessels and for wireless signalling	400
Messrs. H. Hughes & Son, Ltd., for aircraft compasses	2,250

The report mentions claims by some inventors of non-patented articles which the Government has used without assistance from the inventors, and states that the claims are not well founded.

X-ray Martyrs.—Another victim of X-ray injuries has died—M. Demalander, assistant to M. Demenitroux, whose death from the same cause was reported in our issue of January 9th.

Electrical Contractors at Bristol.—In a speech delivered at the recent dinner of the Bristol Branch of the Electrical Contractors' Association (ELEC. REV., January 16th, p. 91), Mr. T. Hood referred to complaints that had been made of employés of the Corporation competing with local contractors in their spare time. Mr. Hood has written to the *Bristol Times and Mirror* stating that his remarks were entirely impersonal and that as a result of inquiries he is "unable to find any foundation for these rumours."

Electrical Contractors' Association (Inc.).—On Tuesday evening the annual dinner of the Association, the N.E.C.T.A., Ltd., and the National Federated Electrical Association, was held at the New Prince's Restaurant, London. Mr. W. Riggs, A.M.I.E.E., the president, occupied the chair, and the function was very enjoyable. A report will appear in our next issue.

Radio Transmission of Photographs. — In view of the recent experiments conducted by the Marconi Co., in conjunction with the Radio Corporation of America, in the transmission of photographs by radio, a new exhibit illustrating the process used, which has been placed in the Western Hall of the Science Museum, South Kensington, is of interest. The exhibit shows a photographic film of the Prince of Wales which was actually used at the Marconi telegraph office in London for the purpose of transmission, a photograph of the portrait as it was received by radio in New York, and a copy of one of the American newspapers in which it was subsequently reproduced.

"Talking" Kinema Films.—With the object of testing the possibilities of a novel development in kinematography, an experiment in combining broadcasting with the display of a film was carried out at Shepherd's Bush Pavilion on January 17th, when an attempt was made to synchronise a picture with a wireless item. The duet, "Specially for You," from the revue at the Prince of Wales' Theatre, was broadcast, and to accompany it a special picture of the scene had been taken. At the beginning the words and picture were perfectly timed, but the picture fell behind the broadcast, and at the conclusion the applause of the audience at the theatre was heard while the film showed the performers still going on with their item.—*Daily Telegraph.*

Local Societies.—EDINBURGH ELECTRICAL SOCIETY.—The first dance and social of the society was held on January 9th, a whist drive being arranged for those not wishing to dance. The chairman thanked the committee for the excellence of the arrangements, and hoped that the affair would be repeated every year.

High-frequency Metal Furnaces.—Dr. C. H. Desch, Dean of the Faculty of Metallurgy at the University of Sheffield, is reported by the *Daily Express* to have stated that furnaces have actually been built and will be working in Sheffield within a few months with power derived from thermionic valves. It was explained that 200-volt d.c. is supplied to the valves, which convert it into a.c. of extremely high frequency—much higher than can be produced by a mechanical generator—that is used to melt metal. The furnaces will be used to manufacture certain nickel alloys, and a piece of Swedish iron is said to have been melted in the manner described before the crucible containing it was thoroughly warm.

An Artificial Larynx.—A device enabling dumb persons to speak has been demonstrated in New York. An artificial larynx, invented by Dr. John MacKenty and the Western Electric Co. restores the power of speech to victims of a cancer operation on the windpipe. The device connects the windpipe by a tube from the throat aperture to a small box containing an artificial vocal chord, whence the vibrations are carried into the speaker's mouth, he modulating them in a manner similar to ordinary speech.—*The Times.*

Electroplating Progress.—Papers presented at the conference of electroplaters, recently held at the U.S. Bureau of Standards in Washington, covered the progress which has been made in the Bureau's laboratories in connection with electroplating research, as well as the experience of those engaged in the commercial application of the subject. Mr. C. T. Thomas, of the Bureau's staff, presented a paper dealing with the protective value of nickel deposits, illustrated with exhibits of specimens which had been plated with nickel and then subjected to various corrosive agencies. In the present state of the art it was brought out that the protection afforded by nickel-plating is far from complete, and it does not seem likely that any single discovery will solve the problem once for all. It will be a matter of slow improvement in methods as the result of increasing scientific knowledge of the process of electroplating and of the numerous variables that affect it.

Mr. M. R. Thomas, also of the Bureau's staff, described the studies now in progress in connection with the nickel-plating of zinc and die castings. Other researches in progress at the Bureau were discussed, including studies of nickel anodes, the effect of impurities in nickel salts, measurements of the hydrogen-ion concentration and the "throwing power" of nickel-plating solutions. The ideal solution would be one that would give an even deposit all over, and this is still far from being attained. It is now possible, however, to make a solution which will give much better distribution of nickel than could be obtained a few years ago.

Institution Notes.

Institution of Electrical Engineers.—PROGRAMMES.—For the second half of the session the following arrangements have been made:—

NORTH-WESTERN CENTRE: February 3rd, Discussion on "Justifiable Small Power Plant," opened by Mr. A. B. Mallinson; February 17th, Mr. H. W. Clothier's paper; February 27th, annual dinner; March 3rd, Major E. I. David's paper; March 17th, Col. T. F. Purves's paper; March 31st, annual general meeting.

The annual dinner will be held at the Midland Hotel, Manchester. As a large attendance is anticipated, members have been requested to apply for tickets not later than Friday, February 20th.

SCOTTISH CENTRE: February 10th, Mr. H. W. Taylor's paper; February 17th, Prof. G. W. O. Howe's Faraday Lecture; February 21st, smoking concert; March 10th, Mr. E. Hughes on "Iron Losses in d.c. Machines"; April 7th, Mr. E. A. Watson, O.B.E., on "The Economic Aspect of the Utilisation of Permanent Magnets in Electrical Apparatus"; April 24th, discussion on "Justifiable Small Power Plant."

NORTH MIDLAND CENTRE: January 27th, Prof. Howe's Faraday Lecture; February 10th, informal discussion on "Domestic Electrical Apparatus"; February 24th, Mr. T. D. Trees on "Selection of Ball and Roller Bearings for Electrical Machines"; March 6th, annual dinner; March 10th, Mr. H. W. Taylor's paper; March 24th, Mr. Clothier's paper; April 28th, annual general meeting and smoking concert.

Tickets for the Faraday Lecture can be obtained by members for friends on application to the honorary secretary, or the municipal electrical engineer of any town in the West Riding of Yorkshire. Early application for tickets is desirable, as the accommodation is limited.

SOUTH MIDLAND CENTRE: January 28th, Prof. Howe's Faraday Lecture; February 18th, Mr. Clothier's paper; February 20th, address by the president, Mr. W. B. Woodhouse; March 11th, Major David's paper; April 1st, Col. Purves's paper.

NORTH-EASTERN CENTRE: January 26th, Mr. L. H. A. Carr on "The Use of Induction Regulators in Feeder Circuits"; February 9th, annual dinner; February 23rd, Mr. Clothier's paper; March 9th, Major David's paper; March 23rd, Col. Purves's paper; April 27th, annual general meeting.

WESTERN CENTRE: February 2nd, Mr. H. Marryat on "Electric Passenger Lifts"; March 2nd, Messrs. L. Breach and H. Midgley on "The Drive of Power Station Auxiliaries"; April 6th, Mr. S. T. Allen on "Radiators and Heating."

IRISH CENTRE: February 12th, Mr. J. H. Shaw on "The Services of the Electrical Engineer in the Post Office"; March 12th, Dr. J. F. Crowley on "The use of Electricity in the Chemical Industries"; April 9th, Mr. P. J. Hayes on "Automatic Telephony."

MERSEY AND NORTH WALES (LIVERPOOL) CENTRE: January 30th, annual dinner; February 16th, Mr. W. E. Bush on "Modern Electric Lighting Practice"; March 16th, informal discussion on "The Application of Electricity on Board Ship"; April 20th, annual general meeting.

INFORMAL MEETINGS (London): January 26th, the National Physical Laboratory; February 9th, Broadcasting; February 23rd, the Electrical Journals; March 2nd, smoking concert; March 23rd, Panel Heating; April 6th, Insulation Problems; April 20th, Latter-day Wireless.

At the informal meeting on January 12th, Mr. P. Dunsheath, M.A., was in the chair when Mr. W. Day opened a discussion on telephonic developments in Great Britain and the United States. He made no comparison between the two countries, explaining that the conditions were so different that a just comparison was not possible. Development in Great Britain had been affected by four vital factors unknown across the Atlantic; they were:—(1) The uncertain period during the negotiations between the Government and the National Telephone Co.; (2) The transition period of handing over; (3) The war (in which the U.S.A. took part for a lesser period than Great Britain); (4) Post-war depression. In the U.S.A., beginning with a little circuit on the top floor of a building in Boston in 1875, by 1880 some 40,000 'phones were in service; by 1890, 200,000; five years later 300,000 'phones; by 1901 a million, and by 1906 3¼ millions; by 1910 six millions and by 1920 12½ millions.

Equally remarkable was the expansion of the range of the circuit—both over and underground. In 1884, less than 10 years after Bell's invention, conversation took place between Boston and New York (230 miles); by 1882 New York with Chicago (900 miles), and by 1915 Boston and San Francisco (3,650 miles).

A useful contribution to the discussion was made by Mr. B. O. Anson, who reminded the meeting that many investigators had worked for the invention, but Graham Bell was apt to get all the credit. A notable pioneer was T. B. Doolittle, whose use of a hard-drawn copper wire circuit was a most definite advance. U.S.A. telephone corporations actually owned factories and made all the apparatus installed. A point that was often overlooked was that in the U.S.A. buildings tended to spread upwards where ours straggled outwards with corresponding spread of the copper lines. One skyscraper in New York had 8,000 'phones. Another interesting point was the variation in the duration of calls. The average holding time in London was three minutes, in Leeds 140 seconds, but in Liverpool only 60 seconds. That meant that a company might operate in Liverpool and make its fortune before a company in Leeds had begun to pay its way. Messrs. J. R. Bedford, S. M. Catterson, P. Dunsheath, A. F. Harmer, R. J. Hines, A. G. Hilling, H. E. Morrish, F. Pooley, E. S. Ritter, J. F. Shipley, H. J. H. Tabor, and J. W. Wheeler also spoke.

WESTERN CENTRE.—This Centre has issued a little booklet containing a history of the Centre, lists of office bearers and members, the programme of the session, &c., and the annual report, which shows that during 1923-24 the choice of meeting places was extended with gratifying results in attendance and general interest in the work of the Centre. Meetings were held in ten different towns; the membership was 552 and the income was £407, there being a balance in hand of £110.

Royal Institution.—On Thursday next, January 27th, at a quarter past five, Sir William Bragg will begin a course of four lectures on the "Properties and Structure of Quartz."

Association of Mining Electrical Engineers.—"How Power Production Costs Affect Colliery Valuations" was the subject of an interesting paper read by Mr. Marshall S. Stewart, consulting mining engineer, Swansea, at a recent meeting of the South Wales Branch of the Association at Cardiff. Mr. Idris Jones, A.M.I.E.E., presided, and at the outset the hon. secretary, Mr. H. G. Norton, A.M.I.E.E., announced that the Mining Association of Great Britain had decided to accept the certificate of membership of the Association of Mining Electrical Engineers as a proof of the professional qualifications of the engineer.

Mr. Marshall Stewart's idea in attempting to reduce power costs was to endeavour to effect the greatest economy with existing plant and machinery. The majority of collieries were by no means economical users of coal and the coal-mining industry was one wherein there were tremendous opportunities for the greater use of electrical power in increasing the "get" per man. The Coal Mines Act laid down strict regulations in connection with the use of electricity in mines,

which tended to make some people consider that the use of electricity was dangerous underground, and for that reason its introduction in many collieries had been bitterly opposed. However, mine accidents due directly to the use of electrical power did not exceed 1 per cent. of all mine accidents. He was sorry to admit it, but it was a fact that the present-day mining engineer had so many matters to attend to at the collieries that he was absolutely unable to deal minutely with the mechanical and electrical details of the undertaking.

Forthcoming meetings of the London Branch are as follows:—

February 10th.—"Switchgear for Mines," by Mr. H. W. Clothier.
March 10th.—"The Design of Controllers for Electric Winders and Haulages," by Mr. A. West.
April 14th.—"The Economical and General Considerations in Connection with the Installation of Winding and Haulage Plant," by Mr. J. F. Perry.

South African Institute of Electrical Engineers.—ANNUAL DINNER.—The annual dinner of the Institute was held on December 5th at Johannesburg, the Governor-General, Earl Athlone, being the guest of the evening. Mr. B. Sankey, the president, said that in South Africa they were on the eve of great developments, both in the direction of electrical and mechanical engineering. The future of the country depended to no small extent on the energy and ability of its engineers. The Governor-General presented certificates and V.F.P. premiums for contributions to the proceedings of the Institute.—*S. African Power Engineer.*

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

Mr. R. H. NUTTALL, rolling stock superintendent to the Doncaster Corporation Tramways, has been appointed general manager of the Luton Corporation Tramways.

The Hammersmith Borough Council Establishment Committee recommends that a honorarium of £250 be paid Mr. F. HILL, chief assistant electrical engineer, in respect of the additional services rendered by him during the period of Mr. Bell's absence and since his retirement, and also pending the filling of the vacant office of borough electrical engineer and manager. The Committee further recommends that Mr. F. Hill be appointed to the position of borough electrical engineer and manager at an inclusive salary of £1,000 per annum, rising by annual increments of £50 to £1,200 per annum.

The London County Council Highways Committee recommends that Mr. F. SCHOFIELD, formerly manager of the Leyton tramways, be appointed assistant operation superintendent in the traffic branch of the tramways department at a salary of £500 a year (£684), rising to £600 a year (based on pre-war conditions). Mr. Schofield has been acting in a temporary capacity as assistant operating superintendent for the past two or three years. The appointment is to date from April 1st, 1924. It is also recommended that Mr. J. R. WALKER, inspecting engineer in the electrical branch of the tramways department, be promoted as from April 1st, 1924, to the grade of senior technical assistant, at a salary of £450 a year (£621), rising by annual increments to £500 a year (based on pre-war conditions); that Mr. A. G. EVANS, technical assistant, Grade 1, in the electrical branch of the tramways department, be promoted as from April 1st, 1925, to the grade of senior technical assistant, at a salary of £400 a year (£558), rising to £500 a year (based on pre-war conditions); and that Mr. G. W. STUBBINGS, technical assistant, Grade 2, in the electrical branch of the tramways department, be promoted as from April 1st, 1925, to the grade of technical assistant, Grade 1, at a salary of £300 a year (£432), rising to £400 a year (based on pre-war conditions).

Mr. W. RANDALL, M.C., of the Associated Power Co., Ltd., of Charanpur, Dist. Burdwan, India, will be in England from March next to August, inclusive, and his address during that period will be c/o 128, Harefield Road, Coventry.

Mr. A. E. KEMP, M.C., D.C.M., late chief clerk at the Aldershot Electricity Works, who is leaving to take up an appointment with the Hackney Borough Council, has been presented by the staff with a silver half-hunter watch.

Chesterfield Town Council has appointed Mr. G. H. MARGRAVE, of Wakefield, local manager of the Yorkshire and West Riding Electric Tramways Co., Ltd., as tramways manager, at £650 per annum.

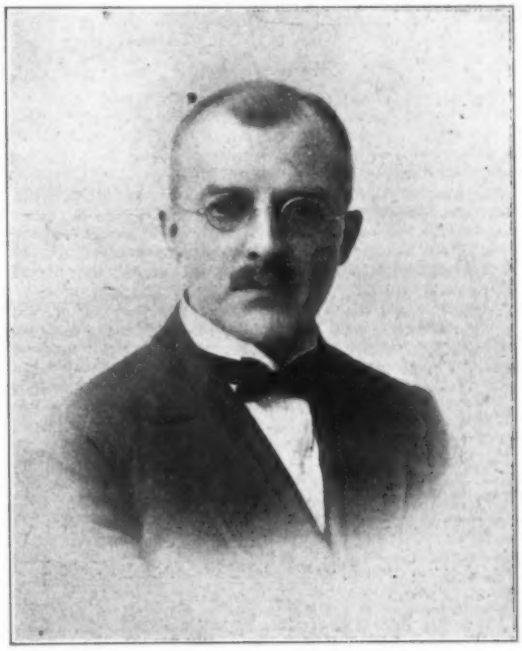
Wolverhampton Town Council has increased the salary of the tramways manager, Mr. C. O. SILVERS to £850.

Mr. F. CHILCOTT has been appointed chief draughtsman at the Wolverhampton Corporation electricity works, in succession to the late Mr. J. Challons, at a salary of £323 16s. 8d. per annum.

Swansea Electricity Committee has appointed Mr. D. R. GREY as technical assistant at the electricity station, in Class 7 of the E.P.E.A. scale, present salary £354 14s. per annum.

Mr. H. W. FAIRMAN, F.I.S.A., secretary of Faraday House Electrical Engineering College, has been appointed to the Council of the Secretaries' Association.

As announced in our last issue, Mr. HARRY BOOTH, O.B.E., is retiring from the office of Electricity Commissioner to-morrow, January 24th, after completing over 40 years in the public service. The Minister of Transport has consented to his services being retained by the Electricity Commissioners in a consultative capacity for a period of 12 months. Mr. Booth has been closely associated, in an administrative capacity, with all the developments of electricity supply for the last 35 years, including Lord Cross's Committee of 1898 (Electrical Energy—Generating Stations and Supply), the Kitson Committee of 1900 on Electric Power Bills, the Bills for the Electric Lighting (Clauses) Act, 1899, the Electric Lighting Act, 1909, and the various Electric Power Acts, including the many Bills for dealing with the London electricity supply



Mr. Harry Booth, O.B.E.,
who retires from the office of Electricity Commissioner to-morrow.

problem. In the course of his career he has had to deal with nearly 1,800 Provisional and Special Orders. Mr. Booth was a member of the Electric Power Supply Committee, and was associated with Sir John Snell in the preparation and the carrying through of the Electricity Supply Bill of 1919, promoted to give effect to the recommendations of that Committee. He was appointed an Electricity Commissioner on January 31st, 1920, and thus has served five years in that capacity.

Miss ELSIE VINE has retired from the Torquay tramway service, after being engaged therein for seven years. Miss Vine is the last woman to serve on the cars as conductor.

We are informed that the four charge engineers at the Kirkcaldy Power Station have been reduced from Class C to B owing to a mistake which was originally made in classifying the station.

Mr. J. M. G. REES, A.M.I.E.E., who has been for several years chief engineer of the Oliver Pell Control, Ltd., has been elected a director of the company.

The salary of Mr. S. T. ALLEN, borough electrical engineer at Wolverhampton, has been increased from £1,200 to £1,450 per annum.

Mr. HOWARD DUNCAN, who has completed three years with the Dundee Electricity Department, has secured an appointment with Lobitos Oilfields, Ltd.

Mr. ERNEST HAMBLOCH, Commercial Secretary to the British Embassy at Rio de Janeiro, whose last report is reviewed in this issue, will attend at the Department of Overseas Trade for a few days, beginning on January 26th, for the purpose of interviewing British manufacturers and merchants interested in export trade to Brazil. Applications for interviews should be addressed to the Comptroller-General, Department of Overseas Trade, 35, Old Queen Street, S.W 1. (Reference 5609/T.G.)

The Islington Corporation Electricity Committee has appointed Mr. PERCY BRIGGS, of Peterborough, as assistant charge engineer, at a salary of £294 13s. 9d. per annum.

Epsom Urban Council has appointed Mr. HERBERT JOHN EVANS, late chief assistant electrical engineer, Port of Calcutta, as assistant electrical engineer, at a salary of £350 per annum, to carry no bonus. There were 99 applications for the appointment.

The Salaries Committee of the Carlisle City Council has approved of the Electricity Committee's recommendation that the salary of the electrical engineer be increased from £965 to £1,000 per annum, as from April 1st last.

Mr. L. K. POTTS, assistant mains engineer with the Carlisle electricity department, has been appointed to a similar post with the Ilford Urban District Council. Last Friday he was presented with a smoker's cabinet and slide rule by the city electrical engineer (Mr. C. W. Salt) on behalf of the staff and employés of the department.

At a meeting of the Council of the Institution of Civil Engineers, held on January 13th, Senator G. Marconi, G.C.V.O., LL.D., was unanimously elected an honorary member of the Institution.

Obituary.—MR. W. H. JOHNS.—We regret to report the death of Mr. W. H. Johns, of "Clears," Reigate, which took place rather suddenly on the 9th inst., following an operation. The deceased gentleman, who was 54 years of age, was well known to a wide circle of friends in the electrical industry and outside. For many years past he had filled the position of manager of the Instrument Department of Messrs. Johnson & Phillips, Ltd., Charlton, with which firm he had been associated practically all his working life, having joined them in 1890, after an apprenticeship served with Messrs. J. Stone & Co., of Deptford. Mr. Johns, who had an attractive personality, is greatly missed by his colleagues at Charlton. The funeral took place at Reigate on the 13th inst.

M. L. OTIS-CHEVALIER.—The death is reported from Charleroi, Belgium, at the age of 40 years, of M. Leon Otis-Chevalier. The deceased was head of the electro-technical department of the Ateliers de Constructions Electriques de Jeumont, and had done valuable work in the development of a.c. motors.

MR. J. B. HAMILTON.—The funeral of Mr. J. B. Hamilton, tramways manager of Leeds, took place at Lawnswood Cemetery on 13th inst., in the presence of some thousands of people, among them being many members of the Leeds Corporation, officials of departments, and representatives of tramway undertakings from all parts of the country. A number of tramway inspectors acted as pall-bearers, and some hundreds of tramway employés followed in uniform.

New Companies Registered.

Rowland, Edwards & Co., Ltd. (203,037).—Private company. Registered January 10th. Capital, £2,050 in 2,000 7½ per cent. cumulative preference shares of £1 each and 1,000 founders' shares of 1s. each. To acquire certain patents for inventions relating to electrical accumulators and deck chairs, &c. The permanent governing directors are:—W. R. Edwards, 256, Gloucester Terrace, Hyde Park, W.; L. C. Sharman, 9, Pembroke Avenue, Hove, Sussex. Qualification, 1 share of either class. Remuneration, £25 each per annum. Secretary: L. C. Sharman. Registered office: Southampton House, 317, High Holborn, W.C.1.

Arrel Manufacturing Co., Ltd. (203,045).—Private company. Registered January 12th. Capital, £1,000 in £1 shares. To carry on the business of mechanical, electrical and general engineers, manufacturers and repairers of, and dealers in machine and hand tools, mechanical and engineering appliances and implements, motors, motor and other cycles, electrical and wireless accessories, importers and distributors of goods made abroad, whether in Germany, France, America, the Colonies, or elsewhere, &c. The first directors are:—R. H. Lash, "Astley Cottage," Letchworth (director, Robert Lash, Ltd.); H. M. Selson, "Little Orchard," Sweetcroft Lane, Hillingdon, Middlesex (director of Selson Engineering Co., Ltd., and other companies). Qualification, £1. Solicitors: Rubenstein, Nash & Co., 5 and 6, Raymond Buildings, Gray's Inn, W.C.1. Registered office: 2, Leys Avenue, Letchworth.

Duff Brothers, Ltd. (203,048).—Private company. Registered January 12th. Capital, £2,100 in 2,000 "A" shares of 1s. and 1,000 "B" and 1,000 "C" shares of £1. The profits are to be distributed as to 25 per cent. on the "A" shares, and as to the remaining 75 per cent. on the "B" and "C" shares as one class. To carry on the business of electrical apparatus manufacturers and dealers, electricians, electrical and mechanical engineers, manufacturers of, and dealers in electrical and other instruments, promoters of the study and development of radio-telephony or telegraphy and other applications of electricity or magnetism, &c. The subscribers (each with one share) are:—S. G. Duff, 10, Rangoon Street, E.C.3, copper merchant; H. Hancocks, 34, Euston Avenue, Watford, engineer. The subscribers are to appoint the first directors. Solicitors: Linklaters and Paines, 2, Bond Court, Walbrook, E.C.4. Registered office: 10, Rangoon Street, E.C.3.

The Municipal Power Raising Co., Ltd. (202,942).—Registered as a private company on January 7th, with a nominal capital of £100 in 1s. shares. The objects are:—To manufacture, purchase or hire or let on hire any type of plant or machinery necessary for carrying out the business of the company, viz., to collect, store, buy and sell, convert in gas products, steam or electrical power, all rubbish, house and trade refuse, sewage, sludge or waste material; also to carry on the business of manufacturers of and dealers in fertilisers and chemicals, &c. The first directors are:—T. W. Cashman, J.P., "High Croft," Tilehurst, Berks., commercial agent; J. Gordon, 119, Constantine Road, Hampstead, N.W.3, sales agent. Qualification, £5. Registered office: 163a, Strand, W.C.2.

Export Electric Fittings Co., Ltd. (203,156).—Private company. Registered January 16th. Capital, £2,000 in £1 shares. To carry on the business of manufacturers, importers and exporters of, agents for, and dealers in electric lamps, fittings, and accessories of all kinds, electricians, ironmongers, engineers, &c. The directors are:—I. Goldberg (permanent), 138, Clapton Common, E.5; B. Halpern, 83, Sandringham Road, Dalston, E.8. Qualification, 10 shares. Remuneration as fixed by the company. Secretary: I. Goldberg. Solicitor: W. Goodwin. 39-40, Mitre Street, E.C. Registered office: 29, Aldgate Avenue, Aldgate, E.1.

Southampton Wire and Cable Manufacturing Co., Ltd. (203,171).—Private company. Registered January 16th. Capital, £250 in £1 shares (150 6 per cent. cumulative preference and 100 ordinary). To adopt an agreement with J. Hart and to carry on the business of a wire and cable manufacturer, &c., carried on by him at 25, Bell Street, Southampton. The first directors are:—J. Hart, 8, Marina, Southampton, cable manufacturer; D. Telfer, 12, High Street, Southampton, accountant. Qualification, 25 shares. Remuneration, £2 each per annum (chairman £5). Secretary: D. Telfer. Registered office: 12, High Street, Southampton.

Clayton Motors, Ltd. (203,132).—Private company. Registered January 15th. Capital, £300 in £1 shares. To carry on the business of manufacturers of, and dealers in electric motors, dynamos, batteries, generators of electricity, electric lighting sets, electric engines, accumulators, internal combustion and steam engines, &c. The first directors are:—A. V. Clayton, 5, Dover Street, W.1, engineer; Mrs. L. L. Clayton, 5, Dover Street, W.1. Solicitors: Hepworth & Chadwick, 14, Butts Court, Leeds. Registered office: Room 42, Craven House, Kingsway, W.C.2.

Northern Lift and Electrical Co., Ltd. (203,085).—Private company. Registered January 13th. Capital, £500 in £1 shares. To carry on the business of electric and hydraulic lift and hoist makers, electrical and mechanical engineers, &c. The first directors are:—W. F. Smalley, 30, Chandos Road, Chorlton-cum-Hardy, Manchester; H. T. Hall, "The Briars," Rectory Lane, Prestwich, Manchester. Qualification, 10 shares. Secretary: H. T. Hall. Solicitor: R. B. Stephenson, 34, Castle Street, Liverpool. Registered office: 288, Deansgate, Manchester.

Official Returns of Electrical Companies.

Thermal Electric Works (Hackbridge), Ltd.—Satisfaction in full on January 5th, 1925, of debenture dated July 15th, 1921, securing £300. Debenture dated January 5th, 1925, to secure £3,000 charged on the company's undertaking and property, present and future, including uncalled capital. Holder: A. Keene, 5, Barmouth Road, Wandsworth Common, S.W.

McLeod & Sons, Ltd.—Debenture dated December 29th, 1924, to secure £100, charged on the company's property, present and future, including uncalled capital. Holders: John Parkes & Sons, 11, St. George's Crescent, Liverpool.

Madras Electric Tramways (1904), Ltd.—Satisfaction in full on November 25th, 1924, of trust deeds dated March 18th, 1904, July 20th, 1906, and February 28th, 1907, securing £65,900.

Southern Electric Free Wiring Co., Ltd. (64,550).—Return dated November 4th, 1924. Capital, £5,000 in £1 shares. 1,510 shares taken up. £1,510 paid. Mortgages and charges, nil.

Kidderminster and District Electric Lighting and Traction Co., Ltd. (59,972).—Return dated July 1st (filed September 26th), 1924. Capital, £100,000 in 5,000 preference and 5,000 ordinary shares of £10 each. 3,000 preference and 4,700 ordinary shares taken up. £77,000 paid. Mortgages and charges, nil.

Wareham Electric Supply Co., Ltd.—Charge on certain land in Wareham, dated December 31st, 1924, to secure amounts due or to become due under building certificates. Holders: F. W. Pond and F. A. Walton, Swanage.

Pickvance, Ltd.—Issue on January 8th, 1925, of £50 debentures (second series), part of a series already registered.

National Signs, Ltd.—Debenture dated December 18th, 1924, charged on real and leasehold properties, goodwill, and other assets of the company, and collateral charge on freehold factory and premises known as "Colindale," and leasehold messuages adjoining Nos. 2 and 3, Annesley Avenue, Collindale, Hendon, dated January 7th, 1925, to secure £2,000. Holders: H. L. Curl, Warwick; and F. J. Dormer, 4, London Wall Buildings, E.C.

Southern Counties Electric Light and Power Supply, Ltd.—Particulars filed of £25,000 debentures and premium of 5 per cent. authorised by resolutions of December 12th and 19th, 1924, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

New Italian Art Association, Ltd.—Debenture dated January 7th, 1925, to secure all moneys not exceeding £3,000, for which the holder (Sir Alan Hutchings, K.B.E., 60, Eaton Terrace, S.W.1) and his co-guarantors may become liable by virtue of a guarantee to the company's bankers, charged on the company's undertaking and property, present and future, including uncalled capital.

Venner Time Switches, Ltd.—Satisfaction to the extent of £2,450 on December 1st, 1924, of debentures dated July 10th, 1911, securing £5,000.

Electric Supply Corporation, Ltd.—Satisfaction on December 24th, 1924, of trust deed dated July 18th, 1904, securing the payment of all moneys for the time being owing on the security of the said trust deed.

A. C. Cossor, Ltd.—Satisfaction in full (*a*) on December 31st, 1924, of debentures dated July 9th, 1908, securing £3,500; (*b*) on May 9th, 1924, of charge dated June 18th, 1918, securing all moneys payable or to become payable under an agreement dated February 7th, 1918; and (*c*) on May 9th, 1924, of Land Registry charge dated June 18th, 1918, collateral to an indenture of same date securing £3,000 of the amount secured by the principal indenture.

Bower Electric, Ltd.—Issue on various dates from December 4th to 23rd, 1924, of £7,000 debentures, parts of a series already registered.

City Notes.

Electrolytic Zinc Co. of Australasia, Ltd.

The annual general meeting was held at Melbourne in October last under the presidency of the Hon. W. L. Baillieu (chairman). The chairman said that the past year had been one of solid achievement and progress. The daily output of zinc had increased from 120 to 130 tons, which was the maximum possible under present conditions. The industry had been established and had settled down to routine operation. Steps were being taken to recover the whole of the sulphur separated from the zinc, and a further development was the production of super-phosphate fertiliser at Risdon (Tasmania).

The company had experienced no difficulty whatever in disposing of its zinc; the quality of the product made it acceptable to manufacturers of all classes.

Cable advices state that the company has declared dividends at the rate of 11 per cent. upon the preference and ordinary shares for the half-year ended December 31st last. The deferred ordinary shares do not participate in this dividend.

S. Smith & Sons (Motor Accessories), Ltd.

THE annual meeting was held on January 12th, Mr. W. Henderson-Cleland (chairman) presiding. In the course of his speech, the chairman said that the financial position of the company had been improved by the redemption of debentures, the re-valuation of properties, and the writing-off of considerable amounts for depreciation. So long as the motor trade continued prosperous, there was no reason why, in course of time, the company should not regain its former prosperity. He hoped that they would soon be able to present a scheme for the permanent financing of the company, which alone would enable it to return to a dividend-earning position.

Michigan Electric Railway.

The company failed to pay the interest due on January 1st on the first and refunding 5 per cent. gold bonds, and a committee has been formed to protect the bondholders' interests. The *Financial Times* says that it has been arranged that bondholders shall place their bonds in the hands of the depositories of the committee. The British depositories are Messrs. Pynchon & Co., Drapers' Gardens, E.C.2.

French Companies.

The Manufacture Parisienne de Fils et Cables Electriques, of Paris, reports net profits of 191,000 fr. for 1923-24, as against 48,000 fr. in the previous year. The dividend is at the rate of 10 per cent. per ordinary share.

The *Société pour l'Equipement Electrique des Véhicules*, of Issy (Seine), reports that the branches in Paris, Lyons, and Brussels are constantly developing, and the directors are following the course of events in the lighting of railway coaches both in France and abroad. The net profits for 1923-24 are returned at 2,445,000 fr., as compared with 899,000 fr. in the previous year, and the dividend has been fixed at 45 fr. per share, as against 30 fr. in 1922-23 on the old capital, and at 28.60 fr. on the new shares.

La Société de l'Energie Electrique du Nord de la France is increasing its capital from 49,887,500 to 70 million fr.

Stock Exchange Notices.—The undermentioned have been ordered to be officially quoted :—

Enfield Cable Works.—202,056 ordinary shares of £1 each, fully paid, Nos. 1 to 202,056.

South Wales Power Co.—250,000 6½ per cent. cumulative preference shares of £1 each, fully paid, Nos. 1 to 250,000.

Victoria Falls and Transvaal Power Co.—1,000,000 ordinary shares of £1 each, fully paid, Nos. 1 to 1,000,000.

Dealings in the following have been specially allowed by the Committee under Rule 159 :—

Marconi Wireless Telegraph of Canada.—1,500,000 shares of $1 each (certificates of rights and fractional certificates).

British Aluminium Co.—£300,000 5 per cent. prior lien debentures, Nos. 8001 to 10,000.

Chili Telephone Co.—31,200 new shares of £5 each, fully paid, Nos. 11,801 to 150,000.

Western Union Telegraph Co.—The New York correspondent of the *Financial Times* reports that the earnings for the year just ended increased by $883,000, and the surplus by $75,000. The 1923 net earnings amounted to $15,915,756, and the surplus to $51,814,706.

Dublin United Tramways Co. (1896), Ltd.—Out of the profits for the past year it is proposed to pay a final dividend of 7 per cent. on the ordinary stock (making 11 per cent. for the year), to set aside £60,000 for track renewals, and £5,000 for overhead work and cables, and to carry forward £15,279.

New Issue.—*Ascot District Gas and Electricity Co., Ltd.*—Messrs. A. & W. Richards are disposing of £34,300 of new 6 per cent. irredeemable preference shares of £10 each, for the company by private tender, at the minimum price of £10 each.

Chloride Electrical Storage Co., Ltd.—The directors have decided to capitalise a part of the reserves by the creation of new ordinary shares, one of which will be allotted in respect of each two shares at present held.

Traction and Power Securities, Ltd.—The directors announce a final dividend of 7 per cent. on the ordinary stock, making 11 per cent. for the year.

Brazilian Traction, Light and Power Co., Ltd.—A quarterly dividend of 1 per cent. has been declared on the ordinary stock.

Chili Telephone Co., Ltd.—The directors have allotted 31,200 new £5 shares, at par, to existing shareholders in the proportion of one new share to each four held.

Shanghai Electric Construction Co., Ltd.—A second interim dividend of 6 per cent. actual has been declared upon the £400,000 old share capital.

Greenwood & Batley, Ltd.—An interim dividend of 2½ per cent. is announced.

Stocks and Shares.

MONDAY EVENING.

WHILE the markets for the best-class industrial shares remain very hard, the general tendency of the Stock Exchange has tended towards reaction. During the past month or two a considerable speculative account has been built up on the bull tack, and for one reason and another, the speculative shares have eased off, spreading an atmosphere of dulness round the House as a whole. The electrical markets have been scarcely affected; the strength of cable manufacturing shares, for instance, continues as robust as ever.

Dividend anticipations are responsible for the firmness shown by shares in the home electricity supply companies. Kensingtons are an outstanding feature of strength, having been 11¼. A slight decline from the best still leaves the price 7s. 6d. up on the week. Westminsters have risen to 11¼, City of Londons to 50s., County of London to 53s. 3d. There is a steady and consistent demand for all the good shares, while the reluctance of holders to part with shares that continue to be regarded with active favour by investors, contributes to a situation in which the supply exceeds the demand.

Cable manufacturing shares, as already mentioned, hold their improvements. British Aluminiums are 1s. 9d. lower after their brisk rise of the past fortnight. Henleys, Callenders, Siemens, Metropolitan-Vickers, General Electrics, Edisons and others of the same class make a fair showing. The General Electric dividend is expected to show a marked increase over the 5 per cent. paid for the preceding year, and rumour has it that the balance-sheet figures will be very satisfactory. Similar anticipations in other cases account for the firmness shown by the group, and the 1924 results are awaited with unusual interest.

Chili Telephone shares are to-day quoted ex the rights of holders to one new ordinary at £5 in respect of every four old shares. The rights are valued as being worth about 2s. 6d. Great Northern Telegraphs have risen to 30. The Eastern division is steady, and wireless shares have not moved. Canadian Marconis remain dull at 4s. 9d. on the announcement that new shares are to be offered, at 4s. 3d., to the present proprietors.

In Underground Railway stocks, both Metropolitans and Districts have shed ¼, but Underground Incomes gained a point at 101. The East London Railway scheme is said to be on the eve of publication: the terms should be out several days before these notes appear.

The list of home and foreign traction issues has nothing of especial interest to attract attention. British Columbia deferred is up 1, and there is rather more disposition to pick up Mexican Utilities, in sympathy with the better feeling that begins to spread towards other Mexican varieties.

Babcock & Wilcox shed a shilling of their recent dramatic rise. Vickers fell back a few pence, and the iron-steel market is dull for choice. Rubber shares weakened, too, as the price of the produce reacted. Business is on a tamer scale, all round the Stock Exchange markets, than it has been for the past month or two.

The quieter conditions have permitted a lengthening of our price-lists by the addition of a dozen or so shares in which a reasonably active market obtains. To answer in advance some of the questions that are certain to arise as to why this share, or the other, is not included, may it be pointed out, with every gesture of courtesy, that public interest is the only test of what prices shall be given, and what left out. It happens often enough that the shares which enjoy a lively market to-day may be neglected and stagnant in the course of a few weeks. But clearly there are many shares which have a right to inclusion in any lists such as ours, and it would be exasperating for readers to find the price-lists exposed to continual alteration. The present additions have been made as the result of much cogitation, and it is hoped that they will be found of general service. Yet another answer may also be given to discount an inquiry that has arisen in the past upon several occasions, and it is to negative, with equal plainness and politeness, the suggestion that prices are ever inserted here in return for payment.

The investor may well beg to be saved from some of his would-be friends. In front of us lies a packet of six different companies whose "securities" are advertised by prospectus, particulars or offers for sale. Here is the sextet :—

Warwickshire & South Midland Electricity Supply Corp., Ltd.
Chagford & Devon Electric Light Co., Ltd.
Navenby & Wellingore Gas Light & Coke Co., Ltd.
Neathfield & Waldron Gas Light & Coke Co., Ltd.
Wareham Electric Supply Co., Ltd.
Electric Light & Power Contracts Finance Corpn., Ltd.

A strong family likeness runs through this group, and reference to several individual members of the party has been made in previous numbers of the ELECTRICAL REVIEW. If particular criticism of one or other of the party should be desired, it can be, unfortunately, given without difficulty. It shall suffice to say here and now that nobody with due regard for the safety of his or her capital should touch the "securities" offered by any one of these concerns. High rates of dividend and interest are the bait held out to the public invited to put money into the concerns. Some people are attracted by the titles of the stocks, but prudence will remember that even first mortgage debentures require to rest upon a firm foundation of real security if money is to be safely employed in them. The whole collection should be left to the people who know most about it.

Share List of Electrical Companies.

	Nom.	Dividend. 1922.	Dividend. 1923.	Price Jan. 19, 1924.	Rise or fall.	Yield p.c.
HOME ELECTRICITY COMPANIES.	£					
Bournemouth and Poole ...	1	10	13	2¾	—	4 19 1
Brompton Ordinary	1	12	10	1⅞	—	*£5 6 8
Charing Cross Ordinary	1	14	14½	2 1/16	—	6 5 7
do. do. do. 4½ Pref.	1	4½	4½	17/6	—	5 2 10
Chelsea	1	10	12	37/6	—	6 8 0
City of London	1	15	15	2½	+1/3	6 0 0
do. do. 6% Pref. ...	1	6	6	23/6	—	5 2 2
Clyde Valley	1	8	8	28/-	—	5 14 4
County of London	1	10	15	53/3	+9d.	5 14 1
do. do. 6% Pref. ...	1	6	6	23/6	—	5 2 2
Edmundson's Ordinary	1	7	7	22/-	—	... ...
do. 7% Pref.	1	6	6	22/6	+6d.	6 4 5
Elec. Supply Corporation ...	1	8	10	27/-	—	7 8 2
Kensington Ordinary	5	12	14	11⅛	+ ⅛	6 5 10
Lancs. Light and Power ...	1	Nil	7½	25/-	—	6 0 0
London Electric	1	10	10	35/-	—	5 14 3
do. do. 6% Pref. ...	5	6	6	5⅞	—	5 9 1
Metropolitan	1	8½	10	1⅞	—	5 6 8
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	5	5½	23/9	—	4 12 7
Newcastle-on-Tyne Ordinary ...	1	2½	6	1⅝	—	5 6 8
do. 5% Pref. ...	1	5	5	18/9	—	5 6 8
do. 7% Pref. ...	1	7	7	25/-	—	5 12 0
Notting Hill 6% Pref.	10	6	6	9⅞	—	6 4 5
North Met. Elec. 6% Pref. ...	1	6	6	1⅛	—	5 6 8
Urban Ordinary	1	—	4	19/3	—	4 4 8
do. 6% Pref. ...	1	5	6	19/6	—	6 3 1
St. James' and Pall Mall ...	5	14½	17½	12⅞	—	6 16 0
South London	1	11	15	2¼	—	6 13 4
South Metropolitan Pref. ...		7	7	1½	—	5 12 0
Westminster Ordinary	5	12	15	11¼	+⅛	6 13 4
Whitehall Elec. Invst. 7½% Pref.	1	7½	7½	1	—	7 10 0
Yorkshire Elec.	1	8	8	29/-	—	5 10 4
HOME RAILS.						
Central London Ord. Assented Stock	4	4	74	—	5 8 1
Metropolitan ... ... „	3½	4	81½	— ½	4 18 2
do. District ... ... „	3	3½	56	— ½	6 5 0
Underground Electric Ordinary	10	Nil	Nil	3⅛	—	Nil
do. do. "A" ...	1	Nil	Nil	10/6	—	Nil
do. do. Income	Bonds	5	6	101	+1	*5 18 10
TELEGRAPHS AND TELEPHONES.						
Anglo-Am. Tel. Pref.	Stock	6	6	105	—	5 14 3
do. Def. ... ... „	1½	1½	24½	—	6 2 5
Automatic Telephone	1	Nil	3	1 1/16	—	2 1 9
Chill Telephone	5	6	6	5⅞	—	*5 6 8
Cuba Sub. Ord.	10	7	7	7	—	10 0 0
Eastern Extension	10	10	10	17	—	*5 17 8
Eastern Tel. Ord.	Stock	10	10	172½	—	*5 16 0
Globe Tel. and T. Ord.	10	10	10	17½	—	*5 16 0
do. do. Pref.	10	6	6	11½	—	5 7 10
Great Northern Tel.	10	24	22	80	+ ½	7 6 8
Indo-European	25	7	7	32½	—	*5 6 1
Marconi	1	15	10	1¼	—	5 18 6
Marconi Marine	1	10	10	1⅛	—	8 17 10
Oriental Telephone Ord. ...	1	12	12	1⅞	—	*6 8 0
United R. Plate Tel.	5	8	8	6 1/16	—	*5 15 5
Western Telegraph		10	10	17	—	*5 17 8
HOME AND FOREIGN TRAMS, &c.						
Anglo-Arg. Trams First Pref. ...	5	12½	5½	3 3/16	—	8 12 6
do. do. 2nd Pref. ...	5	5½	6	2½	—	10 8 8
do. do. 5% Deb. ...	Stock	5	5	75½	—	6 12 5
British Electric Traction Ord. ...	„	5	6	99½	—	6 0 6
do. do. 6% Pref. ...	„	6	6	105½	—	5 13 9
Brazil Traction	100	4	4	58	—	6 18 0
Brit. Columbia Elec. Rly. Pcc.	Stock	5	5	87½	—	5 13 0
do. do. Preferred	„	5	96/-	88⅛	—	*5 8 0
do. do. Deferred	„	8	129/5	112½	+1	*5 15 0
do. do. Deb.	„	4½	4½	81½	—	5 4 4
Lond. & Sub. Trac. 5% Pref. ...	1	5	2½	6/6	—	7 18 10
London United Tram. Deb. ...	Stock	4	4	51½	—	7 15 4
Mexico Trams, 5% Bonds ...	—	Nil	5	71	—	7 0 10
Mexican Light Common ...	100	Nil	Nil	24	—	Nil
do. Pref.	100	Nil	Nil	52½	—	Nil
do. 1st Bonds ...	—	5	5	66	—	7 11 6
Yorkshire (West Riding) ...	1	—	5	1¼	—	4 0 0
MANUFACTURING COMPANIES.						
Babcock & Wilcox	1	20	12	55/-	—1/-	*4 7 3
British Aluminium Ord.	1	5	5	32/-	—1/9	3 2 6
British Elec. Transformer ...	1	Nil	Nil	18/3	—	... ...
British Insulated Ord.	1	15	15	3 1/16	+ 1/16	4 17 6
Brush Ord.	1	10	10	24/6	—	8 3 4
Callenders	1	15	15	3 3/16	—	4 17 6
do. 6½ Pref.	1	6½	6½	23/9	—	5 9 5
Crompton Ord.	1	5	Nil	⅛	—	... ...
Edison-Swan	4/-	7½	10	6/6	+3d.	6 8 0
do. 5% Deb.	Stock	5	5	81½	—	6 0 3
Electric Construction	1	10	10	1⅞	—	5 14 3
Enfield Cable, Pref.	1	7½	7½	94/-	—	6 5 0
English Electric	1	8	5	20/3	—	4 18 9
do. do. Pref.	1	6	6	21/6	—	5 11 7
Gen. Elec. Pref.	1	6½	6½	23/3	—	5 11 10
do. Ord.	1	5	5	23/9	—	4 4 2
Henley	1	15	15	3	—	5 0 0
do. 4½ Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	10	5	17/6	—	*5 14 3
Johnson & Phillips	1	5	5	1 1/16	—	3 18 2
Met-Vickers, Ord.	1	12½	8	1½	—	6 8 0
Met.-Vickers Pref.	2	8	8	2½	—	6 8 0
Siemens Ord.	1	5	—	1½	+9d.	4 0 0
Telegraph Construction	12	20	20	26½	—	*4 10 6

*Dividends paid free of Income Tax.

Market Quotations for Chemicals and Metals.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general and they may vary according to quantities and other circumstances

CHEMICALS, &c.	Price Jan. 20.	Fortnight's Inc. or dec.
a Acid, Oxalic ... ... per lb.	5½d.	...
a Ammoniac, Sal ... ... per ton	£60	...
a Ammonia, Muriate (large crystal) „	£52	...
a Bisulphide of Carbon ... ... „	...	...
a Borax ... ... „	£25	...
a Copper Sulphate ... ... „	£25 10s.	...
a Potash, Chlorate ... ... per lb.	4d. to 4½d.	...
a „ Perchlorate ... ... „	5½d.	...
a Shellac ... ... per cwt.	£15 15s.	...
a Sulphur, Sublimed Flowers ... „	£7 15s.	...
a „ Roll ... ... „	£7 15s.	...
a Soda, Chlorate ... ... per lb.	3d.	...
a „ Crystals ... ... per ton	£5 to £5 5s.	...
a Sodium Bichromate, casks ... per lb.	4d.	...
METALS, &c.		
b Aluminium, Ingots ... ... per ton	£120 to £125	...
b „ Wire ... ... per lb.	1/9 to 2/6*	...
b „ Sheet ... ... „	1/6 to 2/-	...
p Babbitt's Metal and Anti-friction Metal—		...
Grade I ... ... per ton net	£242	£10 dec.
Grade II ... ... „ „	£175	£7 dec.
Grade III ... ... „ „	£102	£4 dec.
c Brass (rolled metal 2" to 12" basis) per lb.	10⅞d.	½d. dec.
c „ Tubes (solid drawn) ... „	1/0½ to 1/0½	...
c „ Wire, basis ... ... „	10½d.	...
c Copper Tubes (solid drawn) ... „	1/1½	...
c „ Bars (best selected) ... per ton	£97	...
c „ Sheet ... ... „	£97	...
c „ Rod ... ... „	£9 7	...
d „ (Electrolytic) Bars ... „	£71 5s.	2½- dec.
d „ „ Sheets ... „	£143 10s.	...
d „ „ Wire Rods „	£81 5s.	2½- dec.
d „ „ H.C. Wire per lb.	10½d.	½d. dec.
f Ebonite Rod ... ... „	2/- to 3/6	...
f Sheet ... ... „	2/- to 3/6	...
a German Silver Wire ... ... „	2/3	...
h Gutta-percha, fine ... ... „	8/6	6d. dec.
h India-rubber, Para fine ... ... „	1/7	½d. dec.
f Iron Pig (Cleveland Warrants) ... per ton.	£5 2s. to £5 2s. 6d.	...
f „ Wire, galv. No. 8, P.O. qual. „	£23	£2 dec.
g Lead, English Pig ... ... „	£46	35/- dec.
g Mercury ... ... per bot.	£14 to £14 5s.	5/- dec.
e Mica (in original cases) small ... per lb.	3d. to 3/-	...
e „ „ medium „	4/- to 8/-	...
e „ „ large ... „	10/- to 20/- & up.	...
p Phosphor Bronze, plain castings „	1/3½	...
p „ „ drawn bars & rods „	1/8	...
p „ „ rolled strip & sheet „	1/9½	...
p „ „ wire ... ... „	1/4½	...
c Platinum ... ... per oz.	£26	...
d Silicium Bronze Wire ... ... per lb.	1/0½	...
r Steel, Magnet, in bars ... ... „	8d.	...
a Tin, Block (English) ... ... per ton.	£229 15s. to £230 5s.	£14 15s. dec.
a „ Wire, Nos. 1 to 16 ... ... per lb.	4/2	3d. dec.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
r W. F. Dennis & Co.

Oil Fuel in Steam Furnaces.—In a paper read before the Institute of Marine Engineers, on Tuesday, January 20th, the author, Engineer-Lieut. A. Marsden, R.N., concluded that the economy of a fuel in heating furnaces did not depend altogether on the calorific value of that fuel, but in its capacity to throw off radiant heat and luminosity. In support he quoted some interesting figures taken from tests on a furnace (ashore) with coal and oil fuels. The furnace was a plate-heating one with a heating chamber 12ft. by 15 ft., fired from both sides, and with flame access to the heating chamber. The quantity of coal of 11,000 B.th.u. that had been previously consumed to heat a given plate area had been 370 lb., and, without any furnace alteration save oil fuel burners being placed in the firing doors, and better fitting air dampers, the furnace turned out 20 per cent. more work per hour with 150 lb. of oil fuel of 18,400 B.th.u. The total available heat units in the coal were 2,760,000, and in the coal 4,070,000, showing a reduction of 32 per cent. in the quantity of heat applied to the furnace, yet the furnace was capable of giving an increased output. The whole of this difference was not attributed to difference in flame temperature and luminosity, but must be shared to a certain extent with the economy of less excess air, more complete combustion, and an earlier release of the heat units. Taking coal at 40s. per ton, and oil at 87s. per ton, the cost per hour of running on coal was 6s. 7d., as against 5s. 10½d. for oil.

A Diesel-Electric Locomotive.—It is reported that the Baldwin Locomotive Company is building a Diesel-electric locomotive of 1,000 horse-power, which is said to be the largest yet built anywhere.

Boiler-Room Practice.

Balancing Boiler-Room Heat.

By JOHN BRUCE, A.M.I.E.E.

(Concluded from page 112.)

The loss due to heat carried away by the products of combustion of the hydrogen content of the coal can be calculated by substitution in the formula given in an earlier part of this article, and will be:—

$$\text{Loss in B.th.u.} = H_2\ 9\ [(212-70)+970.4+.48\ (400-212)]$$
$$= 487 \text{ B.th.u.},$$

and as a percentage:—

$$= \frac{487}{10{,}500} \times 100$$
$$= 4.64 \text{ per cent.}$$

The loss due to the moisture content of the coal is calculated in a somewhat similar manner as previously explained, and will be:—

$$\text{Loss in B.th.u.} = 0.11 \times [(212-70)+970.4+.48\ (400-212)]$$
$$= 132 \text{ B.th.u.},$$

and as a percentage:—

$$= \frac{132}{10{,}500} \times 100 = 1.26 \text{ per cent.}$$

The loss due to the presence of CO in the flue gases, or in other words, due to incomplete combustion of carbon is determined by the fraction of carbon appearing as carbon-monoxide. The loss from this source can be calculated from the following formula:—

$$\text{Loss in B.th.u.} = \frac{CO}{CO_2 + CO} \times 10{,}150 \times c$$

where CO and CO_2 are the value of these constituents determined by an analysis of the gases.

c = weight of carbon burned and appearing in the flue gases and corrected, as previously explained, for carbon in ash.

10,150 = B.th.u. liberated when one lb. of carbon in carbon-monoxide is burned to carbon-dioxide.

For the case given, the loss in terms of B.th.u. per lb. of coal will be:—

$$\text{B.th.u.} = \frac{0.2}{13.0+0.2} \times 10{,}150 \times 0.68$$
$$= 104 \text{ B.th.u.},$$

and as a percentage:—

$$= \frac{104}{10{,}500} \times 100$$
$$= 1.00 \text{ per cent.}$$

The calculation of the loss due to incomplete combustion of carbon can be facilitated by the use of charts and tables. An example of a useful table for this purpose is given in Table XII. This table covers a range

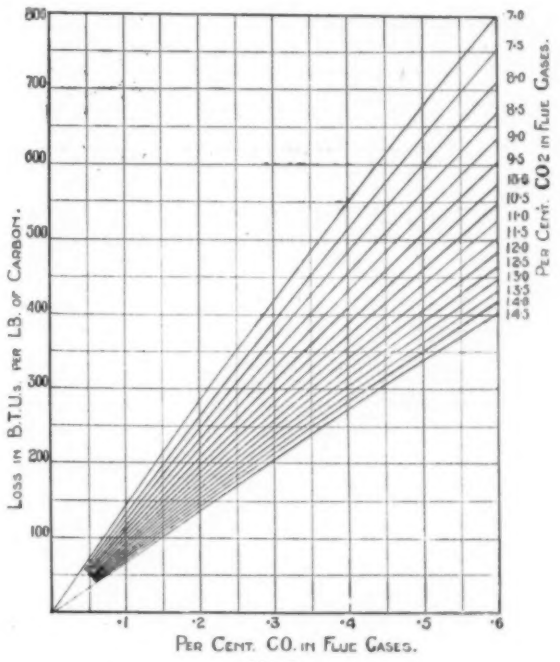


Fig. 5.

of from 0.1 to 2.0 per cent. CO, and from 7.0 to 14.5 per cent. CO_2, and will be found useful in many instances. It should be noted that the loss is given directly in B.th.u. per lb. of carbon, and in practice the value read from the table will have to be multiplied by the carbon fraction for the particular coal consumed. As a rule, in a well-operated plant the loss due to CO does not vary much beyond the lower ranges of the table given, and for the determination of the intermediate values at the lower end of the CO scale, the curves in fig. 5 will be found useful. It should be noted of course that the B.th.u. loss values in fig. 5

TABLE XII.

Per Cent. Vol. CO_2	Per Cent. Volume CO in Gases.																			
	·1	·2	·3	·4	·5	·6	·7	·8	·9	1·0	1·1	1·2	1·3	1·4	1·5	1·6	1·7	1·8	1·9	2·0
7·0	142	284	416	550	677	801	923	1040	1156	1270	1378	1485	1590	1691	1790	1890	1984	2076	2161	2255
7·5	132	264	390	515	635	751	867	979	1088	1195	1298	1400	1500	1599	1690	1786	1876	1964	2050	2140
8·0	122	248	367	484	598	708	817	923	1026	1128	1226	1323	1420	1512	1603	1690	1780	1863	1947	2030
8·5	117	234	346	456	564	669	773	874	972	1069	1162	1255	1347	1437	1522	1610	1692	1772	1851	1933
9·0	111	221	328	432	535	634	733	829	922	1015	1104	1192	1280	1369	1450	1533	1612	1692	1768	1845
9·5	106	209	311	410	507	602	696	789	879	967	1052	1139	1223	1305	1384	1464	1540	1616	1690	1763
10·0	100	199	295	390	483	574	664	752	838	922	1005	1086	1167	1249	1323	1400	1474	1549	1620	1690
10·5	96	190	282	372	462	548	634	719	802	882	963	1040	1118	1195	1268	1344	1413	1485	1555	1624
11·0	91	182	269	356	442	525	607	688	768	845	922	998	1072	1148	1218	1290	1359	1427	1493	1560
11·5	87	174	258	342	423	503	583	660	736	812	886	959	1030	1101	1171	1240	1308	1372	1439	1504
12·0	84	167	248	328	406	483	559	635	707	781	852	922	992	1060	1128	1194	1259	1321	1389	1450
12·5	81	160	238	314	390	465	538	611	682	752	820	888	956	1024	1087	1151	1214	1278	1339	1400
13·0	78	154	229	304	376	447	518	589	657	725	792	857	922	988	1050	1112	1173	1234	1291	1353
13·5	75	148	221	292	363	431	500	568	635	700	764	828	892	955	1014	1077	1135	1192	1250	1310
14·0	72	143	213	282	350	417	484	549	613	676	738	800	862	923	982	1041	1099	1156	1210	1269
14·5	69	138	206	272	338	403	468	531	593	655	715	775	834	895	952	1010	1064	1120	1174	1230

Loss due to CO, B.th.u. per lb. of Carbon.
B.th.u. loss per lb. of Coal = B th.u. from table × Carbon content of Coal.

must also be corrected for the carbon content of the coal concerned. The loss due to unconsumed combustible gases is, in a well operated plant, fairly negligible up to about 14.00 per cent. CO_2. Above the critical point of combustion the rate of increase of unconsumed gas will be governed by the type and setting of the stoker and the class of coal consumed. The higher CO_2 values represent a decreased loss in the dry flue gases, but such decreased loss is offset by the increasing loss due to CO and unconsumed gases. Further, at the higher ranges of CO_2 values, it will be found that the effect of increased CO_2 is to lower the total steam temperature and the total heat content of the steam. The final product of a generating station is electrical energy, and when considering the possible standards for boiler efficiencies, due regard must be paid to the effect of increased boiler efficiency on the water rate of the turbine room. It may be found that the best overall results should be obtained with a CO_2 lower than that at which maximum boiler-room efficiency is given, and possibly it may even be advantageous to carry a slight percentage of CO. These remarks open a very wide subject which cannot be fully discussed in the present article, suffice it to say, that no definite rule can be laid down, and the correct combination of conditions can only be determined by experimental and research work on the plant concerned.

In the construction of a heat balance report, the loss due to combustible matter carried over in the ash can also be expressed in graphical or tabular form for the range likely to be met with in practice. The loss can also, of course, be calculated from the following formula:—

$$\text{Loss in B.th.u.} = \frac{c \times e}{100} \times 14{,}600$$

where c = ash content of coal (from analysis) expressed as a fraction.

e = combustible content of ashes removed from ash pits, expressed as a fraction.

and for the case given, the loss expressed in B.th.u. per lb. of coal will be $0.02 \times 14{,}600 = 292$ B.th.u., and as a percentage 2.78 per cent.

TABLE XIII.

Per Cent. Combustible in Ash.	Weight of Ash (by Analysis) per lb. of Coal.																		
	·05	·06	·07	·08	·09	·10	·11	·12	·13	·14	·15	·16	·17	·18	·19	·20	·21	·22	·23
10	73	87	102	117	131	146	161	175	190	204	219	234	248	263	277	292	306	321	336
15	109	131	153	175	197	219	241	263	285	307	329	351	373	395	417	439	461	482	504
20	146	175	204	238	262	292	321	350	379	408	438	467	496	522	555	584	613	643	672
25	182	219	255	292	328	365	402	438	474	511	548	584	621	657	694	730	767	803	839
30	219	262	306	350	394	438	482	526	570	614	658	702	746	790	834	878	922	964	1008
35	255	306	357	408	459	511	562	613	664	715	767	818	869	920	972	1023	1074	1125	1176
40	292	350	408	466	524	584	642	700	758	816	876	934	992	1050	1110	1168	1226	1286	1344

Loss due to unconsumed carbon carried over in Ash. B.T.U's. per lb. of Coal.

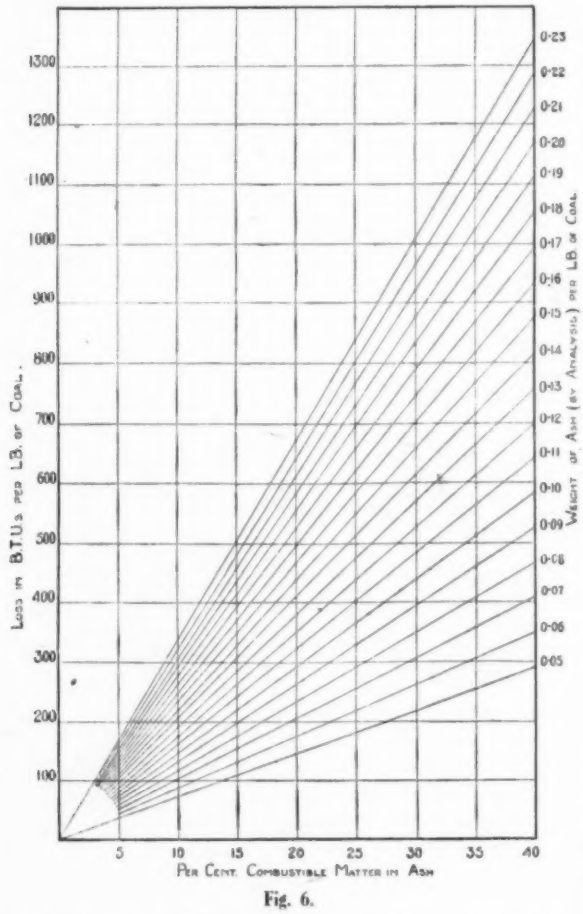


Fig. 6.

Tables or graphs from which the carbon in ash loss can be readily determined are simple to construct. Table XIII gives the loss directly for a range of combustible in ash from 10.00 to 40.00 per cent., and for a range of ash content of coal from 5.00 to 23.00 per cent. For more accurate work, involving the determination of values intermediate to those given in the table, use can be made of the curves in fig. 6.

The remaining item in a heat balance account is usually calculated by difference and expressed as "radiation" and losses unaccounted for, but as previously pointed out, the radiation losses can be reasonably determined from either "still" tests or the "Parsons" line for the particular boiler plant or boiler unit. For the case given, however, we will assume the radiation loss to be 2.00 per cent., which for the coal concerned is equal to a loss of 210 B.th.u. per lb. of coal. We are now in a position to balance the heat account, and this is done in the manner set out in the tabulated statement, Table XIV:—

TABLE XIV.

	B.th.u.	Per cent.
To calorific value of coal as fired ...	10,500	100.00
By heat transfer in boiler	6,438	61.31
By heat transfer in superheater ...	1,052	10.02
By heat transfer in economiser ...	770	7.33
By heat transfer in combined plant...	8,260	78.66
By heat loss in dry flue gases ...	1,045	9.95
By heat loss due to combustion of H_2	487	4.64
By heat loss due to moisture	132	1.26
By heat loss due to CO	104	1.00
By heat loss due to combustible in ash	292	2.78
By heat loss due to "Radiation" ...	210	2.00
Total	10,530	100.29
Less error	30	.29
	10,500	100.00

The foregoing may not convey to the commercial or non-technical man a clear and lucid idea of the meaning of these various losses, but assuming that 200 tons of coal, at £1 per ton, represents the coal consumption covered by the statement, then the boiler plant losses expressed in financial terms are:—

	£ s. d.
By heat loss in dry flue gases	19 18 0
By heat loss due to combustion of H_2	9 5 6
By heat loss due to moisture	2 10 6
By heat loss due to CO	2 0 0
By heat loss due to combustible in ash	5 11 0
By heat loss in "Radiation"	4 0 0
Total	£43 5 0

Further, it should be borne in mind that the example given is representative of very good operating practice, and for the great majority of boiler plants the total given above can be doubled.

Efficient Window Lighting.

By ERIC N. SIMONS.

To talk about window lighting to an electrical retailer may seem somewhat in the nature of carrying coals to Newcastle, but a walk through the streets of many towns that possess retail electrical shops will prove to the satisfaction of any sceptic that window lighting has not by any means been brought to a fine art even by those who, one would think, ought to know most about it.

When all is said and done, any retailer of electrical goods lives by means of light. Inasmuch as his business consists of selling apparatus and appliances that result in artificial illumination, he sells light. That he sells other things as well is unimportant at the moment.

The trouble with so many electrical retailers is that they fail to realise, first, that to sell light one must display it in the shop window just as much as any other commodity; secondly, that the passer-by looks at their windows from a different point of view, and in a more detached way than they do themselves. A scientifically-lighted shop window is as much an advertisement as a full-page in the daily newspaper. Good lighting attracts people to the window in the same way that good typographical arrangement attracts people to a printed advertisement. If the window is ill-lighted, everything in it suffers a certain amount of depreciation in the potential customer's eye. There is cheerfulness, stimulation, encouragement, optimism, in bright lights. A philosophical reflection on the value of illumination can be drawn from a study of inns and taverns, always flooded with light and suggesting cheerfulness in consequence. Good lighting helps the customer to see the goods in the window better, and in the special case of the electrical retailer, to see more clearly than he otherwise could what the goods will do. Here scientific lighting carries conviction as well as encouragement in its beams.

But quite apart from individual retailing considerations, scientific window lighting increases the shopping value of the whole street. Watch a street in which most of the shops are shuttered at night, but in which one or two remain brightly lit. It will be seen that the lighted windows attract attention at once, even the most casual passer-by finding his gaze attracted. But in streets brilliantly lighted throughout, passers-by and window-gazers are far more numerous. Intimately bound up with this question of scientific lighting is that of longer lighting. It must be remembered that although early closing has reduced evening shopping to a considerable extent, it has not reduced the number of people in the streets at night. If anything it has increased them. By leaving the window lighted after closing hours the retailer gives potential customers an opportunity to examine the window's contents at leisure; to discuss them with husbands and fiancés whom they seldom see during the day; to see in nocturnal operation electrical devices that they have seen advertised; and, in short, to make up their minds with much greater certainty. The extra expense of this lighting is amply repaid by increased turnover.

The writer is always astonished by the number of electrical retailers who are ignorant of the first principles of efficient window lighting. This applies particularly to the smaller traders. Many, recognising that their window illumination is not perfect, imagine that what is needed is *more* light, and therefore raise the number of lamps in their window. Often enough, in fact, it is less rather than more light that is needed. What is necessary is to illumine the window's contents primarily, and after that to illumine for purposes of display and advertisement. At many windows, and this can be said particularly of electrical retailers' windows, it is impossible to look with ocular comfort because of the intense glare, causing the dazzled eye to tire speedily. Naked electric bulbs casting their glare on polished metal goods, glass shelves, and so forth make the goods difficult rather than easy to see.

To light the window scientifically, a clean sweep must be made of naked lights. The way to do this is by arranging the bulbs, if the window-dressing scheme renders it possible, at the top, and concealing them in shallow metal troughs. Reflectors or similar devices should then be used in order to project the light down towards the window's interior. It should not be thrown into the eyes of the person examining the goods from without. The proper direction for the light is towards the goods displayed at the back. Of course, it is also admissible to arrange the concealed lamps at the bottom of the window, horizontally. The retailer's own knowledge should enable him to choose proper reflectors, but if he does not know the best type, it will pay him to seek the advice of an expert.

One now comes to the question of how much light should be used. It will be found that this is governed by a number of factors. First of all, the street in which the shop itself stands plays a not inconsiderable part in the ultimate decision. If it is gloomy and beshuttered, like many suburban streets, less light will be needed in order to create an effect than would be the case if the street were handsome and well-lighted. For electrical shops, less light is necessary, again, than for drapery shops, because many of the wares exhibited act themselves as light reflectors, having polished metal surfaces. Exactly how much illumination is necessary for a particular electrical shop cannot, of course, be laid down here, but a formula has been devised by window-lighting experts that should serve the retailer as a rough and ready guide. This formula is: Allow from five to ten watts a square foot, which should ensure that illumination will be adequate. Thus, supposing that the window is twelve feet wide and has a floor area of sixty square feet, there will be needed between 300 and 600 watts (*i.e.*, 60 sq. ft. by 5 or 60 sq. ft. by 10). This amount of illumination can be obtained by using either 60-watt or 100-watt lamps set apart at intervals of 15 in. in the first case or 24 in. in the second.

It must be emphasised that this is only a rough and ready guide, and it must not be adopted without taking into account the other considerations involved. Thus, if the window's depth is exceptional, it may be found advantageous to set hanging lamps above the level of the eye, but covered by reflectors so as to prevent their light from being thrown straight out of the window. Retailers must remember that the primary object is to illuminate the articles in the window, not the faces of the passers-by. Another important factor in estimating the amount of lighting is the intensity of street lighting, the competition from other windows, and so forth.

But the window is but one section of the art of shop-illumination. The entrance demands special attention. Its lighting should never have its general level below that of the window, or else the invitation to enter the shop will look less pressing. On the other hand, after closing hours there is no need to retain the full amount of illumination in the entrance as well as in the window, unless goods are offered for sale in it. Sometimes a too-brightly-lit entrance deludes the passer-by into imagining that by some special dispensation the shop has been enabled to keep open, and tempts him off a tramcar, to his great annoyance eventually when he finds out his error.

Modern window lighting is now turning in the direction of elaborate colour schemes, a subject that cannot be dealt with extensively in this article. A few general notes may, however, have some interest for the retailer who wishes to show specimens of coloured lighting in his window. His choice of colours should be careful.

Yellow light, for example, carries with it a hint of warmth and sunshine. Red has a cosy, comfortable glow, and therefore is the best means of setting off domestic appliances, parlour fittings, and so forth. Green is a calm, gentle, cool colour, indicating the study and the library. It should be used for busy men's reading-lamps and so forth. Blue, on the other hand, is a cold colour, and is apt therefore to cause an unfavourable reaction. Of course, there are many intermediate shades that can be effectively used, and combinations in which two or more colours occur are not without their possibilities. But before indulging in any elaborate window-lighting schemes of this sort, the retailer will do well to take the advice of a specialist in this kind of lighting.

In certain kinds of window dressing, the scheme demands a focusing of attention on a given point, *e.g.*, a group of objects or a particular object. This is done most effectively by means of spot-light projectors. This is a device not to be employed haphazardly, but only as the result of a well-thought-out window plan. The article to which attention is drawn in this striking way must tell its story at a glance, or otherwise a good deal of the effect will be wasted. Just as in an advertisement all sorts of ingenious devices are employed to concentrate the reader's gaze upon a particular paragraph or illustration, so in window lighting the spot-light projector is employed. In each case the objective is the same, and in each case relevance and explicitness are essential to success. It is useless to throw light upon an article, and leave people to find out for themselves why this publicity has been given to it, what the article is for, how it works, what it is doing, and so forth. The swift glance that the spot-light induces must at the same time be a glance that brings complete comprehension. People will not puzzle their eyes and what brains they chance to have in an endeavour to elucidate a mystery in a shop window.

Economic Conditions in Brazil.

A GREAT deal of valuable information is contained in the recently-published report* of the Commercial Secretary at the Rio de Janeiro Embassy (Mr. Ernest Hambloch) to the Department of Overseas Trade.

The first part of the report deals very fully with the financial position of Brazil, and includes a summary of the recommendations of the British Financial Mission; these included a reference to the iron and steel problems and the report deals with this industry later. No improvement took place in the exchange during the period covered by the report, the value of the milreis fluctuating in 1923, between 4 21/32d. and 6d. The lack of rain in the interior, it is thought, will have an adverse effect upon the 1925-26 coffee crop which will be reflected in the exchange. The President of the Republic stated a short time ago that the Government had managed to fix all its floating debt responsibilities and growing improvement in the financial situation was noticeable. He further said that the economic prosperity of Brazil was patent.

Rubber Exports.

As a result of the "Stevenson" restriction of production plan, Brazil has been able to sell her rubber at better prices, although the quantities exported in 1923 were below those of the preceding year; an improvement occurred in 1924, however. The total exports in 1923 amounted to 17,030 metric tons, valued at £1,713,990, as against 19,210 tons (£1,328,700) in 1922. The statistics of exports from Pará for the first half of 1924 show that 10,190 tons of rubber was exported. The British share fell from 4,290 metric tons in 1922, to 3,020 tons in 1923, while that of the largest customer, the United States, increased from 9,480 to 9,990 tons.

The better prices have induced many owners to re-commence tapping their trees and increased production is therefore expected. During 1923 a North American mission visited Brazil to study the possibilities of the Amazon, and particular attention was paid to the production of rubber.

Import Trade.

The import statistics for 1923 show that the British Empire retained its lead with a small increase, the United States following closely, also with a small increase. The German share increased to a greater extent both actually and proportionately. As regards electrical and allied supplies, which are detailed in an appendix to the report, it is seen that Great Britain exported to Brazil larger quantities of boilers, cables and wires, "apparatus for electricity and electric light," and motors, while her supplies of dynamos and generators, and transformers were smaller. Germany showed a remarkable activity, increasing her exports to Brazil under every head save insulated copper wire. United States supplies increased generally.

Railway Electrification.

The project to electrify the Central of Brazil Railway, starting with the suburban section, is still in abeyance, though the necessity for the improvement is increasing daily.

The directorate of the Oeste de Minas Railway has been authorised by the Government to call for tenders for the electrification of the section from the junction with the Central Railway at Barra Mansa to Augusto Pestana (73 km.), and from Bello Horizonte to Divinopolis (Minas Geraes) (156 km.).

The Paulista Railway is extending the already electrified section, Jundiahy to Campinas, from the latter point to Tatú, a distance of 50 km., at a cost of 10,000,000 milreis. This section was expected to be opened at the end of 1924. The power cost on the Jundiahy-Campinas section for the first 20 months of electrical working was 360,000 milreis; it is estimated that coal would have cost 2,700,000 milreis. The cost of the electric locomotives was 800,000 milreis each, as against 600,000 milreis for a steam locomotive.

Radio-Telegraphy and Telephony.

Permission was recently given by the Government to the local newsagency, Agencia Americana, to utilise the Government coastal stations for the purpose of transmitting news-radiograms to ships on the high seas.

The Ministry of Marine contemplates the re-opening of the radio-telegraph station, which existed on the Trinidade Island (about 800 miles from Rio de Janeiro) until 1919, when it was dismantled. It is to be a high-power station for the Brazilian navy, but a meteorological post will also be installed there.

The Government is taking steps to improve the radio-telegraph service. The Amaralina (Bahia) and Olinda (Pernambuco) stations have been repaired and over-hauled, and material has been ordered for the repair of the Acre and Amazonas stations. A station is required between Olinda and the extreme north, especially for the use of coastal navigation.

As regards radio-telephony, the existing stations in Rio de Janeiro can be heard in normal circumstances at Sao Paulo, Bello Horizonte, and Pernambuco. The principal station is that erected by Czecho-Slovakia for the Centenary Exhibition, with a power of 1,500 W. Another station is that of the Praia Vermeelha, which belongs to the Government Telegraph Department. There are also stations at Sao Paulo and Bello Horizonte, and some development is anticipated in other towns in Brazil. Radio-telephony is under the control of the Ministry of Public Works and of the Telegraph Department which is subordinate to that Ministry.

Power Production.

Although estimates vary, it may be stated that the amount of hydro-electric power available in Brazil is not far short of 30 million h.p. with a possible development to over 50 million h.p. It is estimated that of this only a little over 9 million h.p. is at present harnessed.

A local concern is subscribing 4,000 : 000$ in Aracajú (Sergipe) to supply, under State concessions for 50 years involving a guarantee of 9 per cent. on the authorised capital for 10 years, private and public lighting, power and tramway services in that city.

On May 23rd, 1924, the "Diario Official" published the statutes of a local company (Mar Energo) with a registered capital of 1,180 : 000$ to exploit a patent "hydro-motor" having for its object the "utilisation of the energy from waves by transforming the same into motor power."

Iron and Steel.

Mr. Hambloch says that the negotiations for the development of iron and steel industries by a British group, mentioned in his last report, were eventually broken off. An inexperienced committee was formed to deal with the question and nothing of value resulted from its proceedings. The law designed to encourage the industry was eventually sanctioned in January, 1924. Among other things it stipulates for the construction of three works, each with an output of 50,000 tons per annum, one of them, in the Rio Doce, to be equipped with electric furnaces. This particular works is to be constructed by the Government itself.

The Cia. Electro-Metallurgica de Ribeirao Preto (Sao Paulo), working with charcoal and electric furnaces, continues to produce steel with considerable regularity. This is a purely

* Stationery Office. Price 2s. 6d. net.

national concern and has received the maximum loan from the Government. Another company, the Electro-Siderurgica Brazileira, has an electric Bassaneze furnace in Juiz de Fóra with the capacity of from 10 to 12 tons of steel per day.

State Reports.

A considerable section of the publication is devoted to conditions in each of the States which form the Republic. The section dealing with Pará is principally about rubber, which has already been dealt with above. In Maranham a scheme is in hand for the carrying out of water supply, drainage, electric lighting and tramways for the town of S. Luiz. For these purposes a loan of $1,500,000 has been raised in the United States. The contract granted to the South American and General Syndicate for electric lighting and traction has been rescinded, but the company continued to supply energy for public and private lighting up to the end of June last year.

It is reported that German goods, including electrical machinery and apparatus, are again being imported into Pernambuco. In Bahia electrical supplies came chiefly from the United States, Germany and the Netherlands. Nearly all the important houses handling electrical equipment in Sao Paulo are actively pushing the sale of American radio apparatus. A transmitting station is being erected in the city of Sao Paulo which will give an impetus to the sale of these goods, especially in the interior of the State. In the State of Rio Grande do Sul the exports of German goods, including electrical supplies, increased. The goods-handling equipment at Porto Alegre has been considerably improved, a number of electric cranes having been installed.

General.

Distributed throughout the report are notes of interest and value to those concerned with Brazilian foreign trade.

It is stated that local agents and importers of British goods are unanimous in thinking that more business could be done if credit facilities were greater. A large proportion of trade from Great Britain to Brazil is done on reasonable terms of credit, but conditions in Brazil to-day are such that business could probably be extended considerably on reasonably sound lines by close and sympathetic examination of many cases where special credit facilities are requested. Without attention to this the opening up of new business is likely to be difficult.

British firms, it is said, pay insufficient attention to the matter of catalogues for Brazil. Wherever possible these should be printed in Portuguese. American manufacturers afford a good example which might be followed with advantage.

A large number of fraudulent bankruptcies have recently been registered, but it is hoped that co-operation between the authorities and local commercial associations will tend to diminish this abuse.

The British Chambers of Commerce at Rio de Janeiro and Sao Paulo continue to do much useful work, not the least being their co-operation with local commercial associations in bringing to the notice of the competent Government departments questions affecting particular aspects of British trade interests. Representatives of the Federation of British Industries visited Brazil in 1923, and the contact established with Brazilian trade interests, individual and corporate, should prove of value to Anglo-Brazilian trade.

Detailed Import Statistics.

FROM an appendix to the Commercial Secretary's report we reproduce below figures showing the quantities and values of electrical and allied goods imported during 1923, with the 1922 and 1913 figures:—

	1913.	1922.	1923.
Insulated copper wire—			
Total value	£89,400	£123,500	£101,750
		Metric tons.	
,, quantity ...	1,050	1,230	960
Great Britain ...	40	160	220
U.S.A.	750	450	260
Germany	170	380	260
Italy	70	50	70
Electric cables—			
Total value	£169,500	£122,100	£118,200
		Metric tons.	
,, quantity ...	2,580	1,400	1,300
Great Britain ...	1,250	300	460
U.S.A.	490	830	400
Belgium	1	110	170
Germany	580	110	140
Canada	—	410	100
France	150	40	10
Netherlands ...	—	—	4
Apparatus for electricity and electric light—			
Total value	£689,600	£576,300	£637,400
		Metric tons.	
,, quantity ...	7,060	2,690	2,790
Great Britain ...	1,510	380	400
Germany	2,010	840	1,050
U.S.A.	2,940	970	1,050
Dynamos and generators—			
Total value	£61,000	£73,000	£89,600
		Metric tons.	
,, quantity ...	760	360	750
Great Britain ...	100	60	20
U.S.A.	370	160	450
Germany	170	50	230
Motors—			
Total value	£123,100	£224,100	£243,800
		Metric tons.	
,, quantity ...	1,490	1,370	2,000
Great Britain ...	210	130	270
Germany	480	620	1,050
U.S.A.	465	150	250
Italy	85	240	190
Switzerland ...	165	120	80
Transformers—			
Total value	£83,800	£66,400	£140,800
		Metric tons.	
,, quantity ...	1,010	460	1,390
Great Britain ...	40	45	35
Germany	150	160	740
U.S.A.	795	220	430
Boilers—			
Total value	£133,500	£48,300	£82,000
		Metric tons.	
,, quantity ...	3,190	770	1,520
Great Britain ...	2,070	480	820
Germany	640	130	410
U.S.A.	130	20	210
France	190	30	50

The Physical Society of London.

Annual Exhibition of Instruments.

(*Continued from page* 115.)

Evershed & Vignoles, Ltd.

Amongst the exhibits of this firm two items—namely, a traction recorder and a recording "Dionic" water tester—were quite new. The first named is illustrated in fig. 9; it is intended to be fitted in the control cab of an electric train or tramcar, and provides in a compact form five essential records:—(1) track voltage, (2) train current, (3) train speed, (4) application of brakes, (5) start and stop of train. The first three are automatically recorded by a voltmeter, an ammeter, and speed mechanism, while the record of brake applications and train stops are actuated by press buttons or switches controlled by observers, the five records being shown side by side on two charts driven by a common clock mechanism. From the individual and combined charts, readily comparably on the straight time-lines, a great variety of information can be obtained about the behaviour of motor-control apparatus, variations of current in relation to train running, the effect of train load on acceleration, &c. In order to prevent any cramping of the records the instrument is given a chart speed of 6 in. per minute, but other speeds down to ¼ in. per minute can be arranged for without any change of clock mechanism. Vibration difficulties have been overcome by special damping devices and special pen construction, the pen being in contact with the chart paper at all times, and under the worst conditions of car vibration the error does not exceed 1 per cent.

The provisionally protected "Dionic" water tester applies the principle that the electrical conductivity of a dilute solution is proportional to the percentage of inorganic impurity present, and provides a water purity test that is claimed to be much more simple and rapid than any chemical test. The indicating tester has been so successful in industrial work, particularly in testing boiler condensate, that a recording instrument has been developed in a practical compact form suitable for ordinary power-house use. The instrument is constructed in two sections, *i.e.*, water tubes and recorder, housed in two standard dust-proof containers to be mounted on the ordinary switchboard panel, the small motor-generator set (⅛ h.p. motor) being placed at the back of the panel. The operation of the recorder is entirely automatic, no adjustment for temperature being necessary. Alarm devices can be fitted and set to operate whenever the impurity content passes a danger mark, a particularly useful application of this feature

being in connection with condensate where a sudden rise in the percentage of impurity indicates incipient leakage in the condenser.

The Frost radio signal apparatus is the result of joint research by the company and Captain S. G. Frost, and is a particularly compact and simple transmitting set for all classes of emergency use. The set, fig. 10, is housed in a teak case and includes an Evershed generator fitted with the Frost transmitting drum, coupled to a spark or valve transmitter.

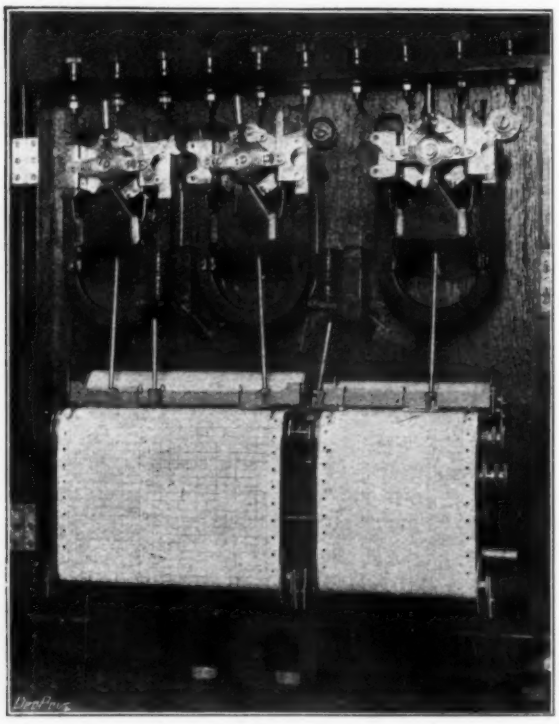


Fig. 9.—Evershed & Vignoles Traction Recorder.

No technical knowledge is required on the part of the operator, a special Morse signal being radiated automatically whenever the generator handle is turned. Two models of the Frost apparatus are available: one with valve transmission for use on aeroplanes, the other with spark transmission and intended to be used on ships' lifeboats. In the valve type of apparatus the generator is a double-wound d.c. machine supplying low-pressure current for the valve filament and h.p. current for the anode; in this type the automatic transmitting drum is included in the grid circuit. In the spark model l.p. a.c. is supplied by the generator, transmitted as a Morse

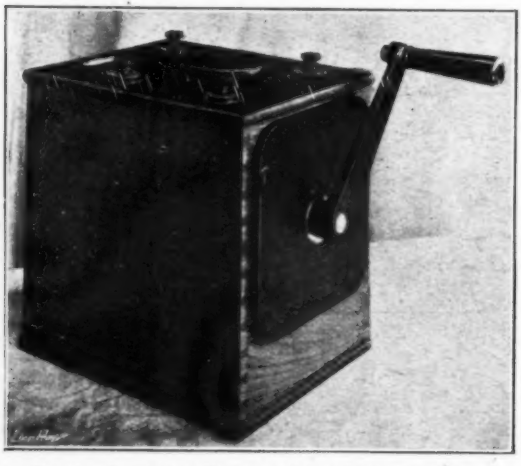


Fig. 10.—Evershed & Vignoles Lifeboat Radio Transmitter.

call by means of the transmitting drum, and stepped up by a transformer for the aerial circuit. Both types occupy less than 2 cu. ft. of space and have a transmitting range of about sixty miles, the actual range depending on the length of aerial and other special conditions. An important feature of the spark type of apparatus for lifeboat use is the lamp switch through which the power supplied by the generator may be used to light an emergency mast-head signal lamp; the switch has three positions, *i.e.*, radio, lamp, radio and lamp.

Foster Instrument Co.

Amongst pyrometers with indicating and recording devices, electrical distance thermometers, millivoltmeters and milliammeters of the "Resilia" pattern, the most noticeable instrument was a continuous chart recorder, fig. 11, suitable for pyrometry or similar electrical measurements where high sensitivity is desirable. As is usual with apparatus of this kind, the record is produced by the periodic depression of a galvanometer boom on to a chart, making a record in a series of dots in order to avoid friction errors which would arise with continuous contact between the galvanometer boom and the chart. The record in this instrument has rectangular co-ordinates, as it is produced by the pressure resulting at a virtual point by the intersection of two knife edges, one carried by the galvanometer boom and the chart travelling over the other. The interposition of a typewriter ribbon produces the visible dot. Ingenious mechanism is incorporated whereby the typewriter ribbon is oscillated (to use effectively the whole width of the ribbon) by a system of cams which are "out of step." When the instrument is required to produce two or more records on one chart an automatic commutator is driven synchronously with the ribbon oscillation, thus producing records in distinguishable colours, and a very simple arrangement enables the contacts to be cleaned without dismounting the commutator; for

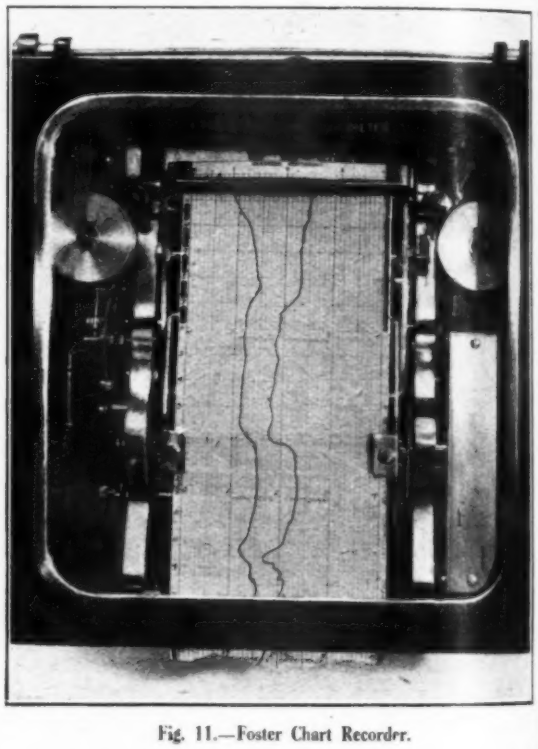


Fig. 11.—Foster Chart Recorder.

work of high sensitivity, particularly at the low-voltages associated with thermo-couple pyrometers, the periodic cleaning of such contacts is very important, and this construction makes the cleaning operation simple. The moving system is carried on pivots and jewels, not a suspension, with a corresponding gain in robustness. This is achieved by the use of the "Resilia" special spring mounting.

Another exhibit has particular connection with the "Resilia" construction. A magnet and pole pieces are carried on one die casting, while the core and moving system are carried upon another, the engagement between the two die castings being determined by a dove-tail fitting. They furnish a very interesting example of successful die-casting work which is done, we understand, by the aid of pyrometers made by the Foster Instrument Co., the actual casting being done at Messrs. Fry's metal foundry. The die castings are so accurately made that the dove-tail fit is quite free from shake and yet capable of hand assembly without undue force, although no machining or finishing whatever was done to either of the two component castings. Not only does this facilitate assembly, but it ensures accurate concentricity between the core and the pole pieces with corresponding accuracy in the scale of the instrument.

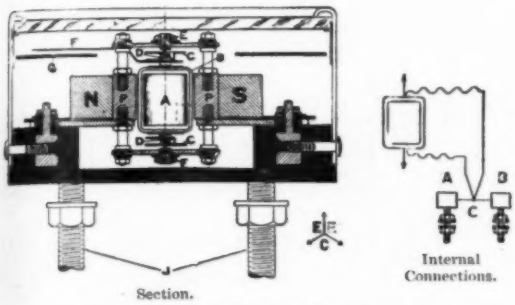
Everett, Edgcumbe & Co., Ltd.

For the direct measurement of mean spherical c.p. at a single measurement, the company's cube photometer is a practical development of the principle that a lamp enclosed in a chamber suitably dimensioned and provided with a highly diffusing inner surface will illuminate the whole of that surface equally and to an extent proportional to the luminous output of the lamp. Thus, by measuring the

brightness of a selected part of the surface, the mean spherical candle-power of, or the lumens emitted by, the lamp can be determined. The cube is entirely self-contained, so that a photometer or a dark room is unnecessary, and the scale is direct reading in either mean spherical candle-power or lumens as preferred. Another pattern is made for use with a photometer bench.

"Inkwell" recording instruments are well known, and "Graphic" meters are made for the purpose of checking the consumer's power factor.

A convenient and portable a.c. testing set consists of two instruments, side by side, one a wattmeter and the other a combined ammeter and voltmeter of the "Universal" moving-iron pattern. To change over from a voltage to a current measurement it is only necessary to depress the appropriate knob, which disconnects the instrument winding from the voltmeter terminals and connects it to the secondary of a small self-contained current transformer, through the primary of which the current to be measured is passed. The standard set has voltmeter and wattmeter ranges of 150, 300, and 600 volts, and a self-contained current range up to 6 amperes. These ranges can be extended to any required extent by the use of instrument transformers.



Section.

Internal Connections.

Fig. 12.—Everett, Edgcumbe Thermo-ammeter.

The firm's electrostatic voltmeter has now been standardised to 300 kilovolts; the readings are unaffected by frequency, and are equally accurate whether one pole is earthed or not. At the other end of the scale a "Dwarf" electrostatic voltmeter, reading up to 3,000 volts, was shown which has a dial diameter of only 3¼ in. To meet the requirements of the "radio fan," a range of small convenient "Dwarf" instruments has been developed with which the various measurements can be made. The company has carried out much research at radio frequencies and has developed a line of ammeters for currents up to 1,000 amperes at frequencies ranging up to 1,000,000 cycles, or more, per second.

Instruments for such measurements are mainly of the hot-wire or thermo-couple types: The former are made in various sizes, the most common being those with dials of approximately 8 in., 6 in., or 2½ in. diameter. A single wire arranged in this way cannot carry more than, say, 5 amperes; in order to increase the range, the use of current transformers represents an improvement on the shunting method, and in Messrs. Everett, Edgcumbe's shielded form of radio-frequency transformer the primary conductors pass through the centre of the laminated iron core and return symmetrically round the outside of it. The secondary winding is evenly disposed round the iron core, and by this means not only is the distribution of magnetic flux made perfectly regular, but all interference from stray fields is eliminated. In the non-shielded transformer for all but small currents, the return conductor must be kept far away, or serious interference and overheating will take place. The transformers are sometimes fitted inside the ammeter case, or may be quite separate from the indicator, the secondary being connected to it by flexible leads.

For many purposes the thermo-ammeter is a still more convenient instrument, and can be designed for currents as small as 130 milli-amperes and self-contained up to 20 amperes. A thermo-ammeter of 2½ in. size is shown in section in fig. 12, the lettering of the parts being as follows:—NS=section through permanent magnet; PP=pole pieces; A=core; B=moving coil; CC=control springs (the upper one being attached to an externally-operated zero adjuster); DD=replaceable pivots; EE=replaceable jewel screws; F=pointer; G=scale; H=base of insulating material, moulded to shape and carrying all working parts; and J=back terminals leading current into instrument.

The internal connections comprise a permanent-magnet moving-coil ammeter, the winding of which is connected to a thermo-couple consisting of two wires of dissimilar metals, A and B, their common junction being heated by a resistance C which carries the current to be measured. The e.m.f. developed at the junction C is necessarily very small and, therefore, the sensitiveness of the moving-coil instrument must be extremely high. Actually, the power consumed in the moving element of the instrument is only about 5 millionths of a watt, when a current corresponding to the full scale value of the instrument is being measured. At the same time, the moving parts are so light (about 0.15 gramme) that the instrument is thoroughly robust and perfectly dead-beat in action.

For voltages up to 300 kilovolts at radio frequency, the Everett, Edgcumbe electrostatic voltmeter, already described, has been modified so as to eliminate difficulties with dielectrics, which are liable at such frequencies to be destroyed in a comparatively short time.

Elliott Bros. (London), Ltd.

Amongst the many instruments on this firm's stand a new pattern of wattmeter was noticed. It is of the dynamometer type and has been designed to give high accuracy both for laboratory and portable use. It has two voltage ranges and two self-contained current ranges, is shielded, and the voltage coil is provided with a "reversing" and "open circuit" switch, so that if the instrument should read backwards the current through the voltage circuit may be reversed without disconnecting. The current circuit is also provided with a self-contained short-circuit switch, by the operation of which the instrument may be protected against sudden surges and overloads similar to those experienced when starting induction motors. The instrument may also be left on circuit indefinitely without fear of errors due to self-heating, and the guaranteed accuracy is within ¼ of 1 per cent. of the full-scale reading.

The Rayworth differential cell-testing voltmeter, fig. 13, has been specially designed for the complete testing of accumulators. It is provided with a differential winding and a cadmium electrode. The instrument can be used as an ordinary cell-testing voltmeter, and, alternatively, will indicate the potential of each plate with respect to the cadmium electrode, thus enabling the condition of the plates of a faulty cell to be accurately ascertained. The instrument is also provided with special marks on the scale; when used as a differential instrument, the positive and negative terminals being connected to the positive and negative plates respectively and the centre terminal to the cadmium electrode, the reading of

Fig. 13.—The Rayworth Cell-testing Voltmeter.

the instrument enables the state of charge of the accumulator to be definitely ascertained, the scale being marked with the fraction of the charge still available for use.

A pressure indicator consists of an electrically-operated valve and a step-by-step contact mechanism whereby internal-combustion engine pressure curves may be plotted to any desired scale. It may be also used to indicate the pressure variation during the scavenging stroke of a Diesel engine as well as the explosion stroke. The curves are plotted in a manner similar to the wave-form curves of an alternator, and the valve is "tight" against pressures up to 1,500 lb. per sq. in.; the apparatus is suitable for speeds up to about 250 r.p.m., but speeds up to 500 r.p.m.. can be dealt with if the device is suitably modified.

(To be continued.)

Tests for Tramcar Drivers.—The Paris correspondent of *The Times* says that the company which owns and runs the tramways and omnibuses of Paris has decided to make sure that its drivers have good nerves. For this purpose it has equipped a laboratory with the electrical appliances invented by Dr. Toulouse for testing the reaction of the human nervous system to sudden impressions of various kinds. Every driver of the company will, in future, have to pass a test in the laboratory before taking charge of a tramcar or omnibus in the street. The object of the test is to see how receptive the brain is to sounds and movements, and how rapidly it can telegraph the necessary instructions to hands and feet.

Exports and Imports of Electrical Goods and Machinery in December, 1924.

THE December Board of Trade returns of electrical import and export business show a falling off in the export values of £34,015 on the November total (in comparing the figures due allowance must be made for the Christmas holidays), the principal reductions occurring in the items for electrical machinery (£23,535 dec.) and telegraph and telephone cable and material (£37,164 dec.); lower values are also recorded in electrical goods and apparatus, glow lamps, meters and instruments, and carbons; the only increases recorded are in the exports of insulated wires and cables and batteries and accumulators. As compared with December, 1923, the electrical exports for the month are £1,666,066 lower in value, due to a reduction in submarine cable business of £1,887,118. Nearly all the other items in the section show steady increases as compared with December of the previous year.

Electrical exports for December, 1924, totalled £550,715, an increase of £93,371 on the previous month's figures; increases are shown in all sections with the exception of carbons, the largest increases being noted in batteries and accumulators (£17,285 inc.), electrical machinery (£38,398 inc.), telegraph and telephone cable and material (£19,647 inc.). In comparison with December, 1923, the total is £236,639 higher, all sections of electrical imports recording considerably enhanced values.

Electrical re-export figures for the month are only £30 higher than in November and £1,246 lower than in December, 1923.

	Exports.			Imports.			Re-Exports.		
	Electrical exports for Dec., 1924.	Inc. or dec. as compared with Nov., 1924.	Inc. or dec. as compared with Dec., 1923.	Electrical imports for Dec., 1924.	Inc. or dec. as compared with Nov., 1924.	Inc. or dec. as compared with Dec., 1923.	Electrical re-exports for Dec., 1924.	Inc. or dec. as compared with Nov., 1924	Inc. or dec. as compared with Dec., 1923.
Electrical goods and apparatus (unenumerated)	£161,692	− £5,625	+ £10,650	£107,380	+ £8,574	+ £22,706	£4.207	−£1,165	+ £55
Insulated wires and cables ...	230,645	+ 24,821	+ 42 73)	50,911	+ 940	+ 19,13 ł	991	+ 98)	+ 5 7
Glow lamps	30,694	− 9,503	+ 1,777	36,250	+ 6,091	+ 9,878	614	+ 180	+ 275
Arc lamps and parts	659	− 320	− 613	1,857	+ 226	− 827	46	+ 4	+ 33
Batteries and accumulators ...	95,059	+ 23,196	+ 38,177	74,481	+ 17,285	+ 59,426	2,053	+ 1,774	+ 1,863
Meters and instruments ...	35,122	− 8,194	+ 1,109	16,165	+ 2,967	+ 7,318	976	+ 3 0	− 599
Carbons	1,181	− 1,687	− 1,972	8,094	− 757	− 1,811	82	+ 34	− 5
Electrical Machinery—									
Electrical machinery (unenumerated)	252,506	+ 36,924	+ 63,278	110,073	+ 38,377	+ 30,406	5,546	− 2,896	− 2,118
Railway and tramway motors	38,160	− 67,263	− 1,963	—	—	—	—	—	—
Other motors and generators ...	174,711	+ 5,365	− 7,879	—	—	—	—	—	—
Switchboards (not telegraph or telephone)	6 691	+ 1,439	+ 1,791	51	+ 21	− 62	—	—	—
Telegraph and Telephone Cable and Material—									
Telegraph and telephone wires and cable (not submarine)	63,991	− 19,494	− 2,738	10 980	− 2,089	+ 6,900	—	− 1,068	− 5
Submarine telegraph and telephone cable	27,096	+ 5,114	− 1,887,118	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus ...	258,579	− 22,781	+ 76,696	134,473	+ 21,736	+ 83,571	4,016	+ 1,788	− 1,342
Totals £1,377,186		−£34,015	—£1.666,066	£550,715	+ £93,371	+ £236,639	£18,531	+ £30	—£1,246

Increases for the twelve months ended December, 1924	Exports.	Imports.	Re-exports.
	+ £1,184,209	+ £1,006,053	+ £34,674

[The Figures for 1923 and 1924 compared.]

Electrical import and export totals for 1923 and 1924, published below, show that electrical exports for the year 1924 were £1,184,209 higher than in 1923, notwithstanding the big drop in submarine cable exports of £2,124,554; electrical machinery export values increased during the year by £1,311,486; telegraph and telephone wires and cables (not submarine) rose by £162,781, telegraph and telephone instruments and apparatus by £780,358, insulated wires and cables by £471,322, and electrical goods and apparatus (unenumerated) by £350,050, counteracting the reduction in submarine cable exports. A falling off is recorded in carbons, £39,280, and switchboards (not telegraph or telephone), £11,721.

Electrical imports for 1924 were £1,006,253 more than in the previous year, the largest increases occurring in the items for telegraph and telephone apparatus, £319,566; batteries and accumulators, £213,013; insulated wires and cables, £168,332; and electrical goods and apparatus (unenumerated), £131,583.

Electrical re-export totals for the year show an increase of £34,674. The figures for telegraph and telephone instruments and apparatus (£32,615 inc.) and electrical goods and apparatus (unenumerated) (£16,798 inc.) record higher values than in 1923; the principal falling off is shown in the electrical machinery section, £22,169.

	Exports.			Imports.			Re-exports.		
	Electrical exports, 1924.	Electrical exports, 1923.	Inc. or dec. in 1924 as compared with 1923	Electrical imports, 1924.	Electrical imports, 1923.	Inc. or dec. in 1924 as compared with 1923.	Electrical re-exports 1924.	Electrical re-exports 1923.	Inc. or dec. in 1924 as compared with 1923.
Elect. goods and apparatus (unenumerated) ...	£1,886,805	£1,536,753	+ £350,050	£1,005,659	£874,076	+ £131,583	£67,471	£50,673	+ £16,498
Insulated wires and cables	2,506,467	2,035,145	+ 471,322	455,588	287,256	+ 168,332	4.230	3,179	+ 1,051
Glow lamps	311,246	338,485	+ 2,761	215,236	218,876	− 3,640	8,551	6,548	+ 2,003
Arc lamps and parts ...	10,547	10,473	+ 74	14,262	17,900	− 3,638	1,118	1,403	− 285
Batteries and accumulators	742,134	558,919	+ 183,215	375,102	162,089	+ 213,013	4,696	4,031	+ 665
Meters and instruments ...	446,204	348,487	+ 97,717	190,415	102,775	+ 87.640	12,308	8 065	+ 4 243
Carbons	27,385	66,665	− 39,280	119,129	92,218	+ 26,911	2,087	2,670	− 583
Electrical Machinery—									
Electrical machinery (unenumerated)	2 374,239	1,676,225	+ 698,014	1,046,665	1,015,641	+ 31,024	87,361	109,530	− 22,169
Railway & tramway motors	597,819	351,485	+ 226,334	—	—	—	—	—	—
Other motors and generators	2,310,523	1,923,385	+ 387,138	—	—	—	—	—	—
Switchboards (not telegraph or telephone) ...	90,918	102,639	− 11,721	501	1,508	− 1,007	1,753	1,297	+ 456
Telegraph and Telephone Cable and Material.—									
Telegraph and telephone wires and cable (not submarine)	1,021,999	859,218	+ 162,781	122,132	85,863	+ 36,269	3,859	3,979	− 120
Submarine telegraph and telephone cable	406.056	2,530,610	− 2,124,554	—	—	—	—	—	—
Telegraph and telephone instruments and apparatus...	2,619,339	1,838,981	+ 780,358	871,726	552,160	+ 319,566	54.794	22,179	+ 32,615
Totals	£15,361,681	£14,177,472	+ £1,184,209	£4,416,415	£3,410,362	+ £1,006,253	£248,228	£213,554	+ £34,674

Compensated Three-Phase Cables.

A 150,000-Volt Transmission System.

THE paper recently read by Major A. M. Taylor, M.I.E.E., M.Am.I.E.E., before the Junior Institution of Engineers, deals primarily with the advances made in connection with the cable designed for use with the Hexaphase system, since the references to this subject in our columns on March 14th and 21st, 1924. It will be recalled that the essential feature of the Hexaphase system cables as devised exclusively for underground work was the utilisation of the two outer conductors in a system of triple-concentric cables in such a way that part of the load to be transmitted was efficiently carried by the external conductors, while at the same time the benefits in the direction of increased transmission voltage consequent upon the employment of intersheaths were fully realised. Since the author's exposition of his original system he has been impressed with the necessity of using such a system in conjunction with overhead transmission lines, and he has devised a scheme whereby the difficulties of connecting underground cables to an ordinary three-phase overhead system can be overcome.

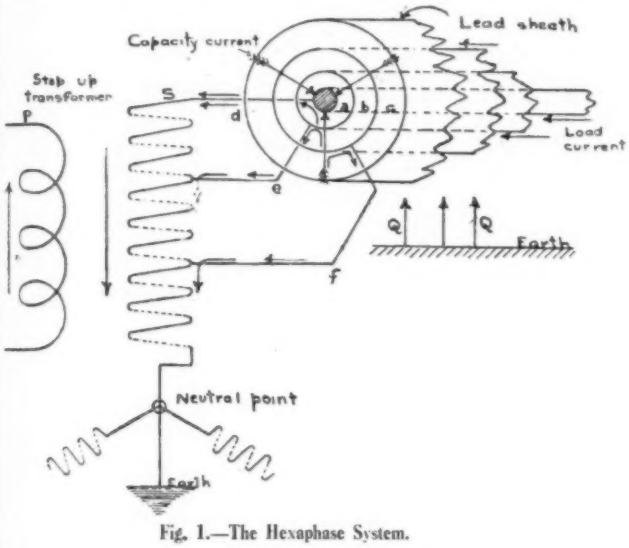


Fig. 1.—The Hexaphase System.

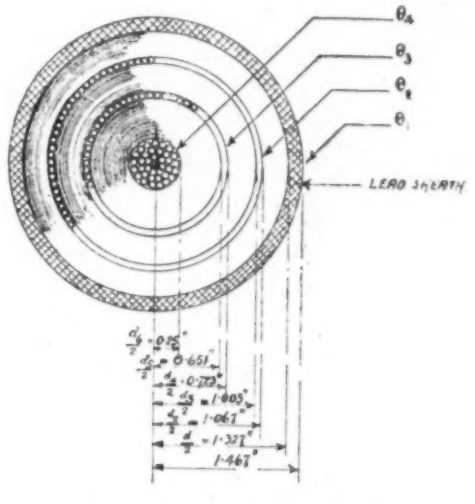


Fig. 2.—Section of the Taylor Cable.

The original arrangement, as shown in fig. 1, in which it will be noticed that the outer conductors take a share in the transmission of the load, is improved upon in the author's new arrangement, in that the charging kVA for the distant parts of the line is passed through the central core only and at the highest pressure. This results in the outer conductors being considerably reduced in cross-sectional area and also in a reduction of the capacitance current in the outers.

The author shows that in the matter of transmission of power at really high voltages, such as 150,000 V, the employment of three-core cables of the ordinary type is quite impracticable, and in view of this considers the feasibility of employing single-core cables of the ordinary type for connecting the ends of 150,000-V overhead lines where these have got to go underground in the approaches to a town; and he endeavours to show that it should be quite practicable to make triple-concentric cables which will stand a voltage between phases of from 150,000 V to 175,000 V.

It has been said that because triple-concentric cables are used having considerably differing capacitances between their various cores, there must necessarily be currents in the three phases that are unequal in amount and differing in their effects upon the transformers which supply them, with consequent unequal voltages and voltages differing in phase on the three phases of the system, but this, it is claimed, is not the case in the compensated three-phase system, in which the phases are all under exactly similar conditions.

The author has had a length of 100 yards of triple-concentric cable made and subjected to very complete tests, both for dielectric hysteresis and breakdown pressure, and the results are in every way very gratifying. A cross section of the cable is given in fig. 2. The cable was designed for use with the Hexaphase system, in which the voltage of transmission (between outers) was to be 150,000 V. It was intended that between each two cores there would be 30,000 V, and the cable has been tested under these conditions.

It was anticipated by two or three cable experts that it would not be possible to construct the cable in the manner intended, namely, to impregnate first of all only the central insulation, and then to continue the manufacture of the cable and to impregnate the two outer insulations in a separate process. It was anticipated that harm might possibly accrue to the central insulation by the double impregnation, but so far as has been observed, both by dielectric power factor and breakdown tests and under the microscope, the insulation has undergone no detriment through the double impregnation. The breakdown tests on the cable were:—

180 kV between inner and intermediate cores for 15 minutes.
120 kV between outer and intermediate cores for 15 minutes.
120 kV between the outer core and lead sheath for 15 minutes.

In one case these voltages failed entirely to break down the cable even though maintained for 15 minutes.

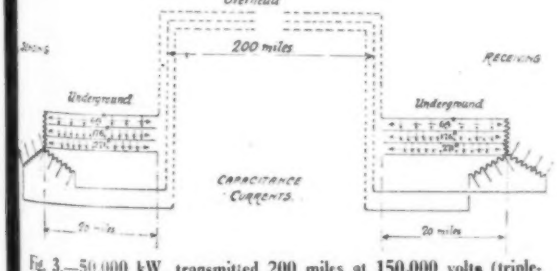


Fig. 3.—50,000 kW. transmitted 200 miles at 150,000 volts (triple-concentric cables).

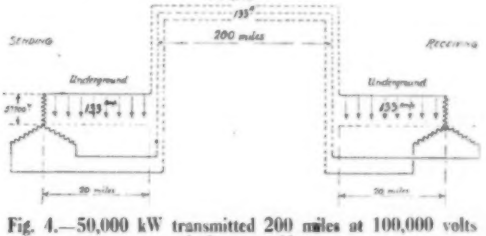


Fig. 4.—50,000 kW transmitted 200 miles at 100,000 volts (single-core cables).

These pressures correspond to 420,000 V between the inner and lead and to 725,000 V between phases, and allowing for a safety factor of 5, this would permit of a working pressure of 145,000 V. The author thinks, however, that a safety factor of 5 is higher than would be expected for a cable for use at such a high pressure.

Fig. 3 shows the lay-out of the author's compensated three-phase system for transmission over an overhead system, with 40 miles of underground cable, 20 miles at each end of the line. The heavy capacitance currents lead to a dielectric loss as great as 918 kW or 1.8 per cent. of the power transmitted (50,000 kW).

The voltage of transmission is 150,000 and the author main-

tains that the ability to use such a high pressure by means of an underground cable of normal dimensions is full justification of the somewhat heavy losses referred to.

For the purpose of comparison the author shows a lay-out for a similar transmission system, fig. 4, but using single-core cables for the underground portion; the pressure of transmission in this case being 100,000 V. Under these conditions the dielectric loss amounts to only about one-half of that in the compensated cable system. But the decreased load carrying capacity of this cable due to the larger dielectric dimensions and the inability to use it for pressures above 100,000 V, destroy the advantages gained by the decreased losses.

The author deals with alleged weaknesses of the intersheath system individually and at length and refers to the paper by Messrs. Clark and Shanklin read before the American Institute of Electrical Engineers in June, 1919.

In reply to questions the author said that although he could not give actual figures, it was safe to say that the costs in connection with the manufacture of his cable were not prohibitive and compared favourably with those of high-pressure cables of the single-core and three-core types; also that the question of jointing would not involve any great difficulty. The president of the Institution in moving a vote of thanks to the author expressed the opinion that the British cable manufacturers were not sufficiently progressive, and exhibited a sample of cable made for super-voltage transmission which he saw under test in Milan some 20 years ago.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Good Loud-Speaker Reproduction.

I was interested in the article on "Some Essentials of Good Loud Speaker Reproduction" published in your issue of the 2nd instant, and beg to trespass on your valuable space to make a few comments on the points where I consider your contributor has rather misled readers.

Now, a subject such as this is bound up in the single word "distortion," an elementary understanding of which is a very necessary prelude to its practical removal from a wireless receiving installation, and as your contributor gave no explanation on this point, I intend, first, to rectify the omission.

There are at least two types of distortion, which we will call (1) "wave distortion," and (2) "amplitude distortion," and these can be present either singly or together in a receiver. The former, as its name indicates, is a change in the form of the audio-frequency wave either by the introduction of harmonics or by the partial suppression of those that should be there. "Amplitude distortion" consists of a different degree of amplification for different frequencies, that is, a "booming" of certain notes and a "weakening" of others. As an example of this we have that very common fault the inferior amplification of bass notes. Strictly speaking, these two forms of distortion are not at all distinct from each other, for since a harmonic is a note of higher frequency than the fundamental, "amplitude distortion" will either increase or diminish it and thereby cause "wave distortion."

"Amplitude distortion" generally makes the "tone" sound high or low, and in some cases causes the loss of extreme notes, such as the lower notes of an organ or the higher notes of the flute. On the other hand, "wave distortion" in its most common form enhances the harmonics, and practically every note has a shrill sort of sound. The suppression of the harmonics produces a muffled effect. In the majority of cases, the valves of a low-frequency amplifier cause the "wave distortion," and the intervalve couplings, the "amplitude distortion."

We now have a fairly clear, if only elementary, knowledge of what we "are up against," and are more in a position to discuss the matter from a practical point of view, so let us now pass to the question of couplings.

Your contributor makes it very pointed that the "resistance capacity" coupling is much more free from distortion than the transformer type, a statement which is hardly fair to the manufacturers of the many good intervalve transformers on the market. Distortion is just as likely to occur in resistance capacity coupling as in transformer coupling, and both require special attention in design and skill in operation to obtain distortionless results. It is *possible*, using resistance capacity coupling and skill, to get practically even amplification from 50 to 10,000 cycles per second, and it is not difficult, using transformers and skill, to obtain even amplification from 200 to 10,000 cycles per second. Most loud speakers, however, have a lower limit of frequency below which they do little, so that it is useless to make efforts to get full amplification at such frequencies. If this were only a matter of a few per cent. one could possibly find a coupling which would sufficiently emphasise the lower tones to compensate for the loud-speaker deficiency, but in many cases the loudness of the loud speaker at, say, 50 cycles, is only about one-tenth of its loudness at 300 or 400 cycles with the same input. Thus as we can sacrifice the lower part of the amplifier scale, we see that there is nothing to choose between "resistance capacity" and "transformer" couplings, but as the latter gives stronger signals than the former, our choice falls on the transformer.

It is essential that a good quality transformer be purchased, and the buyer should notice particularly that the iron core is of good size. Shun any transformer having a core of mean dimensions unless you have definite proof of its good performance. The only main item left to the purchaser to decide is the question of the ratio of the windings. Now the turns ratio should be the square root of the ratio of secondary load to primary outside impedance. As an example, if the load on the secondary were 1 megohm, and the primary outside impedance, which is, of course, the anode impedance of the preceding valve, were 20,000 ohms, the ratio of these would be 50 and, therefore, the turns ratio about 7.

This, however, is only theory, and in practice many difficulties present themselves. For instance, the load put on the transformer by the grid circuit of the following valve depends not only on the valve and its adjustments, but also on the output load on that valve, and it may be that the transformer's own self-capacity may put a heavier load on it than the valve circuit to which it is connected. It will be seen, therefore, that the purchaser can only be guided by approximate considerations which have been founded on practical experience. A good rule to find the ratio required is to divide 250,000 by the output impedance of the previous valve and take the square root of the result. As an example, let us take a valve with an impedance of 16,000 ohms, then $250{,}000 \div 16{,}000 = 16$ (approx.); thus turns ratio $= \sqrt{16} = 4$.

It is found in practice that the comparative strength of high and low tones as reproduced by a transformer-coupled amplifier, may be changed easily by loading the transformer, either primary or secondary, with resistances or condensers or both. A load on the primary will produce the same result as a different load on the secondary. This is according to the following rule: if r is the turns ratio, a condenser c on the secondary produces the same effect as a condenser r^2c on the primary; a resistance R on the primary is equal to a resistance r^2R on the secondary, hence a large resistance and small condenser are used on the secondary. It will generally be found that a resistance below 1 megohm or a condenser above .001 μF will produce either loss of strength or muffling. Any reasonably good transformer will give good results with less loading than this, and obviously the desirable thing is to use such good transformers that no loading is needed at all.

There are many other points with which I disagree in the article in question, but as I have taken up so much space already I will confine myself to one other point only, and that is the question of the valve holder. Your contributor states that valve holders should be made of solid ebonite with legs widely spaced. Now solid ebonite valve holders are quite good in the low-frequency circuits, but should not be used in the high-frequency and rectification circuits. It is preferable to use the ordinary valve legs, thus giving air dielectric for practically the complete length of the holder. The reason is obvious when we think that the specific inductive capacity of ebonite is about 3 as compared with 1 for air.

As regards the spacing of the legs, I would point out that there is only one possible set of dimensions for this, and that, of course, is to suit the valve, which in the case of the British 4-pin cap is standard.

S. J. Matthews.

Seven Kings, *January 15th*, 1925.

Switchgear and the I.E.E. Rules.

Having read many criticisms of the new rules, I have just obtained a copy, but so far have only read those relating to switchgear, and these appear to me to be of so startling a nature that I am surprised no other switchgear maker has so far protested, as these rules apply to all gear from 110 volts upwards, d.c. and a.c.

Take Rule 63 L: Switches "must" (shall) be so arranged that their blades are disconnected from the supply in the "off" position. Will the committee kindly provide diagrams showing how this is done in, say, a simple private installation consisting of two generators running in parallel with battery and booster supplying a ring main through two or three feeders? Clause M is similar. Rule 64 Cc: Every outgoing circuit "must" have a d.p. switch and d.p. fuse. D.p. Home Office type fuses alone are not permitted even on the simplest of 110-volt, d.c. boards.

Rule 64 IB: With every generator a switchboard "must" be supplied fitted with d.p. main switch and fuses for generator, and d.p. switches and fuses for each outgoing circuit. Take the case of a working-class employer struggling to make a living, who after long waiting has managed to save enough money to buy a second-hand oil engine and dynamo, and comes to me to see for how little he can get a switchboard which will do all he requires. Before these rules I might have said: "I have a second-hand ammeter and voltmeter that I will let you have, and all that is actually necessary in addition is a pair of fuses for each of your outgoing circuits, and probably a shunt regulator, and you can just run up your dynamo on to these when you require it;" now I mustn't help him with this advice, he "must" have in addition a d.p.

main switch and fuses, say, for 60 amps., and two further d.p. switches and fuses each for 30 amps., the latter in series with the former, and perhaps six inches away from them, and mind you don't omit the earth indicating device, and all he gets for his additional expense is additional maintenance cost and additional trouble—or I, a member, must tell him that my Institution's rules are rubbish so far as he is concerned.

Rule 64 ICb: When two compound-wound generators are installed to run in parallel, each "must" be fitted with a double-pole overload and reverse circuit breaker and a s.p. equaliser switch interlocked with the breaker so that it must be closed before the breaker, and cannot be opened until the breaker is opened. Apart from the absurdity of having two interlocked equaliser switches at all, with only two machines, my main protest is against the word "shall," which I read as meaning "must." Why should not one s.p., o. and r. breaker on each panel be enough in most cases, and a fuse in the other pole? And, why "must" the poor consumer be forced to have these interlocked with the equaliser, and presumably fitted with a device to render this inoperative with only one machine running, after which it would doubtless remain inoperative?

Again, no fuse must be placed on the back of a panel; not even instrument fuses, though this is frequently the best place in which to fix them, otherwise you may have a considerable length of unprotected instrument wiring connected to main bus bars, which has in the past been the cause of many serious fires. It is also frequently convenient and good practice to fix heavy fuses on the back of panels.

Rule 65: When two generators are installed to run in parallel, there "must" be two voltmeters. Again, why "must?" It is the simplest thing imaginable to parallel two d.c. generators with one voltmeter and a change-over switch.

Rule 66: An earth indicating device must be fitted on every switchboard designed for 110 volts or over.

Rule 67 E: Every switch shall be so designed that the hand of the operator cannot accidentally touch live metal. Surely this is a masterpiece of loose wording, and what a joy for the inspector who comes round to see that you have complied with the regulations, especially if he owes you a grudge.

67 J: Every "electromagnetic" circuit breaker shall be provided with suitable means of adjustment for determining the operating current, and "must" be so arranged that it cannot be held in against the current. I am constantly making circuit breakers with adjustments which cannot be altered, and which must be held in against the load whilst operating. What am I going to do when these rules become compulsory?

I have not read any further than Rule 67; it only makes me tired, though I am quite sure that anyone fond of writing could carry on to the end of the book, on the same lines.

I have been manufacturing high-class switchgear for over 30 years, and the switchgear manufacturers in this country generally, work to a very high standard, and are very much more capable of telling their customers what they ought to have than they can ever learn from these rules.

Should these rules be made compulsory on British switchgear makers, I gather that they could not affect our German competitors, who could then beat us every time, so that I think they should be entitled: "Rules for the Safeguarding of Foreign Electrical Industry in this Country."

Save us from our friends!

Edgar Cox-Walker, M.I.E.E.

Darlington, *January 12th*, 1925.

For some years we have known that a committee of experts was busily engaged in amending what we used to know as the I.E.E. Wiring Rules. Those of us who are engaged on the installation side of the supply industry were quite elated when the Committee's labours materialised as "Regulations for the Electrical Equipment of Buildings, 8th Edition, 1924," became available. The consensus of opinion amongst the profession was, and is, all in favour thereof.

I was one of those who, on December 15th, 1924, were privileged to hear Mr. F. C. Raphael's indictment of the aforesaid 128 "Crimes," as some people term the Regulations, and I adversely criticised Clause 64, Part III, Sections A and B, the three-pole specification being absurd and superfluous. Clause 91G supports Clause 64, whilst Clause 119A verbally contradicts the two previous clauses. I gave figures showing from recent actual quotations that the device specified in Clause 64 cost over 100 per cent. in excess of a similar two-pole device, and accomplished absolutely nothing, either technically or economically, which is not accomplished by two-pole apparatus. I hereby challenge the Rules Committee to produce a single valid argument in support of their specification. Twenty-five per cent. of the speakers were members of the Rules Committee, yet not one of them had the courage of his convictions, except Mr. Cash, who remarked that switches only formed part of the cost of a complete installation. I agree, for the particular orbit in which the speaker revolves. I, personally, know of many single-unit installations where switches form one-third to one-half the total cost of the installation, exclusive of motor. The absurdly low voltage of distribution generally prevailing to-day seriously militates against appreciable progress in the power installation field. Amperes are what inflate installation costs.

W. E. Rogers, A.M.I.E.E.

London, *January 10th*, 1925.

[This letter has been abbreviated.—EDS. ELEC. REV.]

Bonding Lead-Sheathed Cable.

Lately I have had an opportunity of examining a number of installations carried out with flat metal-sheathed cable, and have been impressed with the simplicity of the work, but also with the importance of good bonding.

In some installations the bonding is deplorable; one method I found was binding a piece of wire round the metal sheath of a cable and strapping it across to the other cables. In another case the bonding accessory used was missing.

Such work would not be passed by either the supply or fire insurance company's inspectors if it was not covered up by a pattress or other cover.

Why the I.E.E. Wiring Rules Committee did not put a clause in the wiring rules calling for visible bonding it is difficult to understand.

Visible bonding is now more and more important, and the sooner it is insisted upon by the supply authorities and also fire insurance companies the sooner there will be the assurance of having earth continuity on metal-sheathed systems, because when the bonding is visible, inspection is easy and such bad work as is mentioned above will not get through.

Bonder.

January 16th, 1925.

An Innocent Oscillator.

My house is lighted by means of accumulators, these being charged by a small gas engine and dynamo; the ignition is by a C.A.V. trembler coil working from three of the house cells. Since the "wireless" has taken hold of the masses I find my set, when running, upsets all the wireless sets for some little way round. I am unable to do all my charging outside broadcasting hours, and should deem it a kindness if any of your readers could suggest a remedy.

Electrician.

[No doubt the ignition circuit is acting as a transmitter. Our correspondent should try the effect of enclosing the coil and trembler in a metallic casing, and, if necessary, enclosing the leads in flexible metallic tubing or using lead-sheathed cable.—EDS. ELEC. REV.]

Tidal Power.

I have never, intentionally, condemned Mr. Underwood's American authorities; and, if they or Dr. Johnson have ever said a word in favour of utilising a tidal-dam for the compressing of air which is to be used in a turbine, I will do public penance and make *amende honorable*.

Meanwhile, can you, Sir, or can anybody, tell me where, in France, a tidal device for compressing air may be seen at work?

Wm. H. Massey.

Twyford, *January 18th*, 1925.

Legal.

Climax Patents, Ltd., v. Service Co., Ltd. (London).

IN the Chancery Division, before Mr. Justice Astbury, on January 13th, Mr. Beaumont mentioned this case, and said he had a motion to restrain "passing off." It was not to be contested, but he wished to state the facts. The plaintiffs were the manufacturers of an earth tube for wireless, known as the "Climax" tube. It consisted of a brass tube which was perforated, and could be filled with water. The plaintiffs had a very large sale for these tubes, something like two to three thousand a week. They were under the impression that other persons were selling a tube as theirs (plaintiffs'), and two of their directors happening to walk down High Holborn saw in the window of the defendants' shop a tube which was similar to but not theirs. They asked for a "Climax" earth tube, and were supplied with one of the tubes now in question. Mr. Vaneck appeared for the defendants, and said that he was prepared to treat the motion as the trial of the action, to give a perpetual undertaking in the terms of the motion, to pay the costs, and to consent to an inquiry as to damages, but the plaintiffs would not proceed with the inquiry if the defendants within a certain period satisfied them that the damage sustained was very slight. The defendants would also afford the plaintiffs every opportunity they could for dealing with the person who supplied them with the tubes in question.

Mr. Vaneck agreed, and said the defendants were innocent in the sense that they were given those tubes by somebody else and, unfortunately, they had to suffer for it.

An order was made in the terms arranged by Counsel.

E. E. Rosen & Co. v. Ultra Wireless & Electrical Co.

MR. JUSTICE TOMLIN, in the Chancery Division, on January 13th, on a motion for judgment in this action, granted an injunction restraining defendants from selling any wireless apparatus not made by plaintiffs, under the name of "Ultra," or

any name calculated to lead to the belief that such apparatus was of plaintiffs' manufacture; and also restraining them from using the word "Ultra" in such a way as to lead to the belief that their business was in any way connected with the plaintiffs'. Further, his Lordship granted an inquiry as to damages, and costs.

Objection to Lighting Rate.

AT Holmfirth Police Court, on January 10th, George Hirst, of Fulstone, was summoned for refusing to pay a proportion of rates due to the New Mill District Council. He had deducted 4d. in the £, the cost of the district electric lighting scheme, on the ground that in his particular region no electricity was supplied. The defendant said he objected to public money being spent on "such things as electric lighting." The Bench made an order for payment of the full amount, and told defendant that if he had objections he must fight them out with the District Council.

Southport Corporation v. Birkdale District Electric Supply Co., Ltd.

THE Town Clerk of Southport has submitted to the Finance Committee two opinions of counsel advising the Corporation to appeal against the decision of Mr. Justice Astbury, in the action against the Birkdale District Electric Supply Co. It was resolved that the Town Clerk should be instructed to give notice of appeal on behalf of the Corporation, and that the chairman of the Finance Committee (Councillor Thorburn) together with the chairman of the Electricity Committee (Councillor Owen) should be appointed to confer with and instruct the Town Clerk in the conduct of the appeal.

Theft of Copper Wire.

AT Ayr; on January 16th, two men were convicted of stealing from the sub-station at Irvine copper wire, which they sold to a dealer. One was sent to prison for 60 days and the other was fined £20.

Long Firm Frauds.

BEFORE the Common Serjeant (Sir H. F. Dickens, K.C.), at the Central Criminal Court, on January 14th, Sidney Taylor, 40, merchant, and Herbert William Kelly, 25, fishmonger, surrendered to their bail and pleaded not guilty to an indictment which charged them with conspiracy to defraud and obtaining goods by false pretences.

Mr. EUSTACE FULTON, who appeared for the prosecution, said that the two defendants were indicted with four other persons who had pleaded guilty to the charges. They were Godefridus Werner, 36, fitter; Albert Werrell, 32, traveller; Bill Theobald, 32, traveller, and Rachel Edith Baker, 36, dealer. Counsel said that the offences were commonly known as "long firm frauds." The defendants took premises from where they ordered goods from various people, gave references to one another, and when the goods were delivered they were disposed of and never paid for. Those operations commenced on October 15th, 1923, when prisoner Werrell took premises at 16 and 17, Devonshire Square, E.C., having one room. He was visited there by Taylor and by Werner. The defendant Kelly was some relation of the landlady of the premises and whilst he was there he had done work for Werrell, who traded as the Wall Electrical Co. About the end of March, 1924, it was decided to move and premises were taken at 5a, Kingsland Road, where the frauds were perpetrated. Upon the door of the premises was the name of the Wall Electrical Co., and also that of Richard Fleming, who, Counsel said, was a man of dual personality. It was arranged that Kelly should sometimes be Fleming and sometimes Werrell would adopt that name. There was also put up on the door the name of A. Wheal, who was the defendant Taylor. There was also a young woman named Baker at the premises. Her occupation was to give anyone references when they were required. Counsel said that about May, 1923, they took over the second floor of the premises and in June the rent fell in arrears and distraint was levied, and on July 31st the premises were vacated. Counsel went on to say that goods had been obtained from all over the country, from the Britannia Tube Co., a quqantity of lawn mowers from Drummond Bros., of Guildford, lamps from the Wolf Safety Lamp Co., of Sheffield, a quantity of shovels from Brooks Bros., of Stourbridge, while various goods had been obtained from other firms.

Evidence was then given by representatives of various trade houses in support of Counsel's statements. They said that they had received orders from Fleming and when asked for references satisfactory ones had been supplied by the Wall Electrical Co., Mr. B. Theobald, Mr. G. L. Werner, and others. On the strength of those references, goods had been dispatched, but they had never been paid for.

When the hearing was concluded on Friday, the defendant KELLY withdrew his plea and pleaded "Guilty," and he gave evidence and said that creditors began to press for money about July, 1924, and it was then that he found out that the business was not a genuine one.

THE JUDGE, in passing sentence, said: "These long firm frauds are rampant all over the country and they eat into the very heart of commerce. The public and the trade have to be protected and the only way of putting down these kinds of frauds is by great severity." Taylor was sentenced to three years' penal servitude, Werner to 22 months' hard labour, Werrell to 18 months' hard labour, Theobald to 12 months' hard labour, Baker to four months in the second division, and Kelly to six months' hard labour.

Published Specifications.

Compiled expressly for this journal by Patent Agents.

The name of the applicant's patent agent, if any, will be found on the printed specification.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

16,823. "Electric power transmission systems." H. Birkbeck (J. B. Entz). June 28th, 1923. (226,573.)

21,194. "Method of producing sparkless commutation in dynamo-electric machines." U. Cantutti. August 21st, 1923. (226,577.)

21,370. "Ignition distributors." H. Ford and G. H. Taylor. August 23rd, 1923. (226,578.)

21,837. "Portable loud-speaking telephonic apparatus." E. A. Graham. August 29th, 1923. (226,585.)

21,839. "Variable self-induction apparatus." Marrec, Ltd., and Y. Marrec. August 29th, 1923. (226,586.)

22,812. "Electric selecting apparatus suitable for use in telephony." Relay Automatic Telephone Co., Ltd., and F. M. Ward. September 11th, 1923. (Cognate application 22,813/23.) (Patent of addition not granted. (226,587.)

23,937. "Crystal detectors for wireless receiving apparatus." Burndept, Ltd., C. F. Phillips, and S. F. Woodell. September 25th, 1923. (226,610.)

23,966. "Electrolysis, more particularly in its application to operating internal-combustion engines and internal-combustion turbines." M. Benson. September 25th, 1923. (226,613.)

24,138. "Control of electrically-driven reciprocatory apparatus." Underwood Typewriter Co., Ltd., and J. J. Cooper. September 27th, 1923. (226,619.)

24,309. "Electric generators for signalling purposes." S. G. Frost. September 29th, 1923. (Cognate application 29,096/23.) (Patent of addition not granted.) (226,626.)

24,597. "Telephone apparatus." Radiotive Co. January 31st, 1923. (210,737.)

26,448. "Means for applying electric power to the operation of steering or analogous gear, or in assisting or supplementing hand-power in such operation." W. H. Scott. October 23rd, 1923. (226,638.)

26,827. "Manufacture of continuously loaded electrical conductors." Western Electric Co., Ltd., and J. T. Griffin. October 26th, 1923. (226,641.)

27,573. "Ventilation and cooling of electrical or other machines or apparatus." J. W. Young and Metropolitan-Vickers Electrical Co., Ltd. November 2nd, 1923. (226,646.)

28,277. "Means for controlling the charging of electric batteries." Eclairage des Véhicules sur Rail. November 9th, 1922. (206,869.)

28,284. "Electricity meters." Measurement, Ltd., and F. Holden. November 9th, 1923. (226,650.)

28,465. "Multiplex signalling systems." Western Electric Co., Ltd. (Western Electric Co., Inc.). November 12th, 1923. (226,652.)

28,525. "Thermionic valves or electron discharge tubes, particularly for wireless signalling." Dr. L. A. Levy. November 12th, 1923. (226,654.)

28,780. "Electric wall plugs." J. B. Tucker. November 15th, 1923. (226,658.)

28,906. "Telephones." A. Marr. November 16th, 1923. (226,659.)

29,767. "Lighting magneto for vehicles." E. Baumgartner. November 23rd, 1923. (226,661.)

30,975. "Variable electrical condensers." H. O. Wallis. December 10th, 1923. (226,668.)

1924.

547. "Thermal responsive switches." British Thomson-Houston Co., Ltd. January 8th, 1923. (209,436.)

1,191. "Insulation of electric cables." Siemens Bros. & Co., Ltd., and W. F. Oakfield. January 15th, 1924. (226,685.)

2,052. "Crystal holders for wireless receiving sets." A. Gooch. January 25th, 1924. (226,691.)

2,305. "Loading of electric cables." Siemens Bros. & Co., Ltd., and A. E. Foster. January 29th, 1924. (226,692.)

3,541. "Radio-receiving antennæ." Marconi's Wireless Telegraph Co., Ltd. February 9th, 1924. (211,159.)

4,647. "Dust covers for crystal detectors used in wireless receivers." G. A. Gandy and H. Leat. February 23rd, 1924. (226,708.)

6,727. "Electrodynamic loud speakers." Siemens & Halske Akt. Ges. March 31st, 1923. (Addition to 209,761.) (213,559.)

12,925. "Trolley heads for electric collectors." M. D. Stakler. May 20th, 1924. (226,732.)

18,322. "Electric liquid-break switches." J. Gray (General Electric Co.). July 31st, 1924. (226,750.)

20,974. "Electrically lighted sewing machines." W. Fairweather (Singer Manufacturing Co.). September 5th, 1924. (226,758.)

27,125. "Ignition means for engines of the explosion or internal-combustion type." R. Claudel. August 21st, 1923. (Divided application on 21,175/23.) (226,766.)

Lighting Service Bureau Handbook.—We have received a copy of "Illumination Design Data," a bulletin issued by the Electric Lamp Manufacturers' Association of Great Britain, Ltd. It deals extensively with the four main factors in the design of a lighting system, namely, foot-candles required, type of lighting most suitable for the location, determination of location of points, mounting, height and number of lighting units required, and the ascertaining of the sizes of lamps required. A list showing the foot-candles recommended for the lighting of shops, commercial and public buildings and industrial interiors should be of great value. An illustrated schedule of decorating shades for walls and ceilings, showing the reflection factors for each, is a useful feature of the pamphlet, and the factors are interesting and instructive; they vary from white at 84 per cent. to forest green, coconut brown, and cardinal red at 16 per cent. Tables giving the light units required for various dimensions complete the book as a practical guide. It will be circulated to all electricity supply authorities and to the lamp distributing trade.